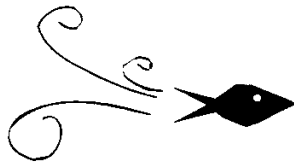
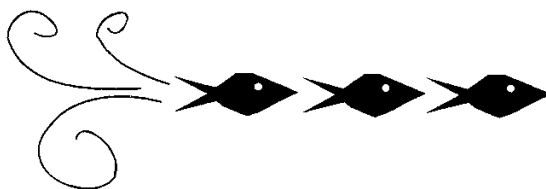


chapter V



**Managing
Municipal
Wastewater**



ACTION PLAN #7

MANAGING MUNICIPAL WASTEWATER

Significant improvement in water quality has been achieved over the past 20 years through implementation of the Clean Water Act and the construction of new and upgraded wastewater treatment facilities. Nonetheless, there are sections of inland and coastal waters that either do not yet meet water quality criteria designed to protect aquatic life, or are otherwise degraded, and the challenge remains as to how best to provide adequate treatment and disposal of sewage as population and development pressures mount in the coastal region.

Wastewater facilities have the potential to cause a local decline in water quality. However, in many instances, both the larger centralized wastewater treatment facilities operated by municipalities and the smaller on-site systems of homeowners also cause *regional* water quality impairment, resulting in a decline in the overall health of the Bays' coastal and inland ecosystems. For example, toxic substances, pathogens, and nutrients in wastewater from both types of facilities have rendered certain receiving waters unfit for drinking and have forced the closure of many acres of valuable shellfish beds and swimming beaches. Clearly, both centralized and on-site systems have advantages and disadvantages related to characteristics such as operation and maintenance, accountability, and environmental protection. No one approach provides the ideal solution. Centralized facilities, described in greater detail in Action Plan #7A, can be an appropriate solution to water quality problems in certain situations; on-site systems, described in Action Plan #7B, may be an appropriate management measure in others.

The extent to which municipal wastewater adversely affects water quality and living resources in the Bays region depends on many factors, including the volume of wastewater generated, its quality of treatment, and the location of its effluent disposal. Because wastewater impacts may be felt over long distances from the origin of discharge, it is essential that wastewater be managed on a comprehensive (i.e., watershed) basis. Through the Executive Office of Environmental Affairs' innovative *Watershed Approach* and the model work of the Massachusetts Bays Program, this approach is beginning to take hold in Massachusetts. However, this has not always been the case. Traditionally, densely developed urban areas have turned almost exclusively to public centralized collection and treatment systems for their wastewater management needs, while rural areas have relied almost solely on

private, standard-design individual on-site disposal systems. While both methods employ a range of technologies and, for a given area and need, may well be the best alternative, they also can create negative impacts, sometimes unforeseen. Use of these methods may preclude other management options that might prove more protective environmentally and less costly socially in the long run. Indeed, throughout the Bays region, there are many geographic settings - especially suburban communities and neighborhoods - where wastewater management needs fall "in between" centralized treatment and standard design on-site disposal. In these areas, a mix of *decentralized* wastewater management options, including package treatment plants, innovative/alternative on-site systems, waste grinder/ STEP systems, and/or management districts, may be preferable. The phrase, "decentralized wastewater management," refers to coordinated management of dispersed on-site or 'near-site,' individual, or neighborhood and community, small-scale, wastewater treatment systems. Please refer to Action Plan #7C for additional discussion of this wastewater management approach.

Managing wastewater wisely and efficiently in the developing coastal watersheds of the Massachusetts Bays region is a major challenge for the region's decisionmakers and its citizens, now and in the future. It is critically important, therefore, that all levels of government work closely and cooperatively to explore the full range of available planning and wastewater management alternatives, and to adopt and implement those that are best suited to a given area and its surrounding watershed's particular wastewater and environmental resource needs.

When choosing among wastewater management options, municipalities should give careful consideration to current and future growth management strategies based on their natural resource capacities and local commitment to achieve and maintain a certain minimum level of environmental quality.

The recommendations presented in the following three action plans - *Managing Centralized Wastewater Treatment Facilities*, *Managing On-Site Sewage Disposal Systems*, and *Decentralized Wastewater Management and Treatment* - are a step in this direction.

7A. ACTION PLAN

FOR

MANAGING CENTRALIZED WASTEWATER TREATMENT FACILITIES

Almost everyone has a morning ritual that involves, among other things, turning on a faucet and flushing a toilet. There is no perceived need to think about where the water comes from, or where it goes after it flows down the drain. Because our water comes and goes so easily, it is easy to forget that the water we use must in some manner be disposed.

In some areas, the water that goes down our drains enters a centralized sewage system for treatment. A sewage system consists of the pipes which collect the wastewater, pumping stations which transport it through the pipes, and a treatment plant (or plants) that remove some of the contaminants before the wastewater is returned to the environment.

There are three levels of sewage treatment:

- *Primary treatment:* the least expensive and most common type of treatment relies exclusively on physical straining and settling to remove solids from the wastewater. During primary treatment, wastewater is screened to remove large solids and then passes to a storage tank where smaller particles are allowed to settle to the bottom. Primary treatment typically removes about one third of the organic solids from the wastewater stream. Chemically enhanced primary treatment is sometimes used, where chemicals are added to the wastewater to enhance solids removal.
- *Secondary treatment:* employs a combination of physical and biological processes that together are much more effective than primary treatment at removing most contaminants. A settling tank is first used to remove suspended particles. Microorganisms are then used to degrade organics which are dissolved in the wastewater. Secondary treatment removes approximately 80-85 percent of the organic matter in the wastewater stream. Many sewage treatment authorities have been required to install secondary treatment facilities to comply with the Clean Water Act.
- *Advanced treatment,* also known as tertiary treatment: includes a variety of more advanced treatment processes currently available. Advanced waste treatment processes

can remove nutrients such as nitrogen and phosphorus, which when allowed to remain in the effluent may cause eutrophication of receiving waters.

Before being discharged, the effluent from a treatment plant is usually disinfected with chlorine or some other chemical to kill harmful pathogens. The effluent then passes through an outfall and into a receiving water body.

All treatment plants produce a semi-solid byproduct called "sludge", which is disposed of separately from the effluent. The quality of this sludge depends in large measure on the concentration of contaminants in the wastewater that reaches the plant. Sludge with low concentrations of toxic materials can be composted and used as a soil additive. Advanced sludge processing facilities -- such as the Massachusetts Water Resources Authority's (MWRA) new facilities at the Fore River Shipyard -- can convert sludge into high-grade fertilizer pellets. If the sludge has high concentrations of toxic contaminants, however, it has no beneficial use. Incineration or disposal at a landfill can be very expensive. For this reason, source reduction programs, designed to minimize initial contaminant loadings, are an important element of most sewage treatment programs. For example, sludge from the MWRA treatment facility has elevated molybdenum concentrations during the summer months, which occasionally precludes its use for production of fertilizer pellets. The source of the molybdenum has been traced to anti-fouling agents in industrial cooling towers and large air conditioning units. The MWRA TRAC (Toxic Reduction and Control) group is working with clients to find substitute compounds to alleviate this problem.

Sewage outfalls are often the single greatest point source of pollution in coastal waters. Not surprisingly, the quality of the treatment plant's discharged effluent can have a dramatic impact on the quality of the receiving waterbody and its living resources. This is especially true if the receiving waterbody is a poorly-flushed embayment, or if the volume of effluent is especially large. In Boston Harbor, for instance, nearly one-third of the freshwater inflow comes from the MWRA's sewage treatment facilities. Discharges of this magnitude can have impacts that reach far beyond the point of discharge.

However, as subsequently described in this section, centralized treatment can be the most viable option for a community, given the community's particular circumstances. In these cases, the impacts of an effluent discharge can be identified, managed, and mitigated.

State and federal agencies regulate discharges from sewage treatment facilities through permits granted under the National Pollutant Discharge Elimination System (NPDES). These permits set thresholds for contaminant concentrations in the effluent. Discharge permits generally set limits for suspended solids, biochemical oxygen demand (BOD), fecal coliform bacteria, and chlorine. They may also set limits on specific chemicals or metals, especially if the sewer system serves industries which use or produce toxic chemicals or if there has been a problem with contaminants in the past. All permits require self-monitoring by the discharger in order to demonstrate compliance with the permit requirements.

In addition, while NPDES permits for municipalities discharging to marine waters typically set limits on BOD, solids, and other conventional pollutants (as described above), it is not common for these permits to include limits on nitrogen and phosphorus, even though these nutrients can adversely impact receiving waters. For example, for marine discharges, the ambient data to support establishing these thresholds is insufficient for large-scale application. Nonetheless, discussions are currently underway with some Massachusetts communities (e.g., Scituate) to set nutrient limits in their permits to discharge wastewater effluent to coastal areas. Further, NPDES permits must ensure compliance with both technology-based requirements and water quality standards, including designated uses and criteria to meet those uses. In addition, in Massachusetts, the NPDES must satisfy, and is otherwise supplemented by, the antidegradation provision of the Commonwealth's Water Quality

Standards. This provision acknowledges the Commonwealth's commitment to: (1) protect existing uses and the water quality necessary to maintain such uses; (2) where the water quality exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, maintain and protect such water quality unless a variance is granted based on a finding that there are no reasonable alternatives and the lowering of water quality is necessary to accommodate economic or social development; and (3) maintain and protect without qualification the outstanding resource waters designated by the state.

As the population of the Massachusetts Bays region continues to grow, the pressure on existing wastewater treatment facilities will grow as well. Unfortunately, some centralized sewage systems in the Massachusetts Bays region will not be able to handle increased flows. Some have antiquated or undersized collection systems, and others are connected to stormwater drains; these result in infiltration and inflow that dramatically reduce the overall effectiveness of the treatment system. Facility improvements almost always require heavy capital outlays that are passed on to the sewage district's ratepayers.

In some instances, there may be no alternative to constructing new centralized wastewater treatment facilities. The MWRA, for example, is required by court order to construct a new secondary treatment plant in order to comply with the Clean Water Act. Fast-growing towns such as Plymouth may need to increase plant capacity to keep up with population growth. But the cost of constructing new sewage facilities can be exorbitant. Other, less expensive options, such as land application and alternative technologies, will need to be evaluated and implemented to help treat and safely dispose of increased sewage flows in the Massachusetts Bays region.

DEM ACTION #7A.1:

The Department of Environmental Management, in collaboration with other state and federal agencies, should continue to implement the Ocean Sanctuaries Act by closely monitoring all facilities plans which propose increased wastewater treatment plant discharges into an ocean sanctuary.

RATIONALE:

With the notable exception of the metropolitan areas south of Lynn and north of Marshfield, most of the Massachusetts Bays coastline below mean low water lies within one of five designated ocean sanctuaries. Under the Ocean Sanctuaries Act (OSA), these sanctuaries must be protected for their "ecological" and "aesthetic" interests. The OSA is designed to protect coastal waters by prohibiting activities that could be environmentally or aesthetically damaging. Prohibited activities include new or increased wastewater discharges; building of any structure on the seabed; mining or removing sand, gravel, or minerals; dumping or discharging of commercial or industrial wastes; incineration of solid waste on vessels; construction of offshore electric stations; and commercial advertising. Some of the prohibited activities *may* be allowed if the project proponent receives a Chapter 91 permit from the Department of Environmental Protection (DEP) and also meets the conditions defined in the regulations as the "public necessity and convenience" standard.

In 1989, the OSA was amended to establish a variance procedure for proposed increases in municipal wastewater discharges into a sanctuary. Prior to the amendment, a community with an existing municipal wastewater discharge into an ocean sanctuary could not correct outstanding pollution problems (increased sewer use or combined sewer overflows, for example) if it meant increasing the volume of effluent or relocating the point of discharge. Effluent volumes had to remain at the original (permitted) volume even if the increased discharge were to be cleaner due to a higher level of treatment.

With the variance procedure in place, increased wastewater discharges are now possible. However, the strict environmental requirements of the variance procedure will ensure that increased discharges remain a last resort. Rigorous scrutiny of wastewater facilities plans will continue to

ensure that alternative disposal technologies are fully explored and that increased discharges will not adversely affect marine water quality or living resources.

RESPONSIBLE AGENT(s):

The Commonwealth's ocean sanctuaries have been placed under the "care and control" of the Massachusetts Department of Environmental Management. Acting as a caretaker rather than a permitting authority, DEM is responsible for reviewing all other state agencies' licensing, permitting, and approval activities in ocean sanctuaries to ensure compliance with the Act. It is the responsibility of all state agencies to conduct their activities in a manner consistent with the provisions of the Act and to confer with the Ocean Sanctuaries Coordinator at DEM.

IMPLEMENTATION STRATEGY:

To implement the Ocean Sanctuaries Act, DEM will continue to assure strict adherence to the environmental review process required under the variance procedure. Variances will be granted only if the proposed wastewater discharge is determined to be the only feasible alternative and receives a *minimum* of secondary treatment. Multiple prerequisites will need to be met and plans developed for pretreatment, water conservation, and the control of infiltration/inflow, sewer connections, and CSOs. DEM will emphasize the requirement that land application and other alternative disposal technologies be fully examined prior to consideration of an ocean discharge, and that water conservation measures be implemented to their fullest practicable extent. DEM also will inform the public that any project in an ocean sanctuary must comply with the "public necessity and convenience" standard set forth in the Ocean Sanctuaries Act and defined in Massachusetts regulations 302 CMR 5.00.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

The cost of implementing this action is for the DEM staff time involved, and will be borne by DEM.

POTENTIAL FUNDING SOURCE(s):

DEM annual operating budget.

TARGET DATE:

Ongoing.

FURTHER INFORMATION:

For further information and assistance, contact:

DEM Ocean Sanctuaries Program
(617) 727-3267

EPA ACTION #7A.2:

The Environmental Protection Agency should support the control of combined sewer overflows in the Massachusetts Bays watersheds, especially the lower Charles River, and should target National Pollutant Discharge Elimination System (NPDES) permitting to implement technology- and water quality-based requirements in the Merrimack River watershed.

RATIONALE:

Combined sewer overflows (CSOs) occur in drainage systems which carry both stormwater runoff and raw sewage, typically during times of high volume flow in what are usually undersized and outdated systems. Without separation and traditional treatment of the sewage component, CSOs can be major sources of harmful pathogens, toxics, and debris. The presence of numerous CSOs in the Massachusetts Bays and their watersheds has led to limitations on human contact through swimming, the closure of economically important shellfish beds, and a general decline in environmental quality. This is especially true in the lower Charles River, where this important urban resource is currently neither swimmable nor fishable due to both CSOs and a number of cumulative nonpoint sources of water pollution (e.g., stormwater runoff).

Additional water quality problems resulting from inadequately treated and managed wastewater and CSOs include high levels of toxic pollutants and metals which surpass the ability of the receiving water to assimilate and dilute these contaminants to concentrations below acceptable limits. Reduction of the sources of these pollutants (e.g., via pollutant-specific limits, BMPs) is a proven solution to these problems. The need to manage these water quality problems is especially pressing in the Merrimack River watershed, which is known to be a major contributor of toxic pollutants and metals to the Massachusetts Bays.

The water quality problems noted above result partially from wastewater discharges, which are subject to the NPDES program. Under this program, such discharges into wetlands, waterways, and waterbodies are required to obtain a permit which sets limits for various contaminants in the discharge. These permit limits are typically met through a variety of remedial and preventive measures which are implemented at or by the wastewater treatment plant.

RESPONSIBLE AGENT(s):

NPDES permitting and compliance for wastewater discharges is the joint responsibility of the EPA and the Department of Environmental Protection (DEP). Permitting actions will be developed and implemented with the coordination and cooperation of involved agencies such as the Massachusetts Water Resources Authority (MWRA). Further, any NPDES permitting will be integrated with existing, holistic efforts to better manage and protect the Charles River Watershed (e.g., EPA's Lower Charles Initiative). Finally, this action will be implemented in accordance with EPA's Combined Sewer Overflow Policy, as published in the Federal Register on April 19, 1994.

IMPLEMENTATION STRATEGY:

No major organizational efforts are needed to implement this recommendation in the specified areas, since EPA staff resources dedicated to the NPDES program will be redirected to the lower Charles River and Merrimack River discharges, in coordination with the Massachusetts DEP.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

Minimal, since the recommended action will be carried out by EPA staff who are already funded by the agency's operating budget.

POTENTIAL FUNDING SOURCE(s):

Agency operating budgets.

TARGET DATE:

Ongoing.

FURTHER INFORMATION:

For further information and assistance, contact:

EPA - New England
(617) 565-4422

EPA/EOEA/DEP/CZM PARTNERSHIP ACTION #7A.3:

The Environmental Protection Agency, Executive Office of Environmental Affairs, Department of Environmental Protection, and Coastal Zone Management Office should work collaboratively to develop and implement an effective program for monitoring and enforcing point source discharges from wastewater treatment plants and energy-producing facilities.

RATIONALE:

In Massachusetts, there are 32 municipal wastewater treatment plants (WWTP) and six energy-producing facilities with discharges to near coastal waters. These discharges have the potential to cause localized and regional declines in receiving water quality - with resultant adverse impacts to living marine resources and coastal habitats - unless closely monitored on a regular basis. Opportunities exist to improve the existing discharge permitting and enforcement structure so as to maximize facility compliance and pollutant removal effectiveness.

PROPOSED ACTIONS:

Accordingly, the following CCMP actions are proposed. These are expected to be developed and articulated more fully in future supplements to the CCMP.

1. EPA/DEP Action

In order to develop a streamlined and concise permitting and enforcement strategy to manage point source discharges, EPA-New England should consider delegating the NPDES permit program to the Massachusetts Department of Environmental Protection (DEP).

2. DEP/CZM/EPA Action

Consistent with the EOEa Basin Management Initiative, DEP and the Massachusetts Coastal Zone Man-

agement Office (CZM) should re-evaluate the effectiveness of the current NPDES program and, with EPA, redesign the program to achieve effective pollution reduction, including pollution trading and other innovative "offsets/credits" models; all to the extent authorized by existing law.

3. EOEa/DEP/CZM Action

EOEA, DEP, and CZM should pursue state legislation to modify the Massachusetts Clean Waters Act to meet EPA requirements for NPDES delegation. Legislation has been before the state legislature for some time without additional action.

4. CZM/DEP Action

CZM and DEP should assemble an interagency team to develop criteria for a routine comprehensive evaluation of coastal WWTP discharges. The evaluation should focus on permit compliance and pollution removal effectiveness to assist in prioritizing key issues within coastal watersheds. Priorities thus identified should be used to focus state agency program actions.

Monitoring plans developed by dischargers should be reviewed by appropriate agency staff (e.g., EPA, DEP, MBP, CZM) to ensure use of performance-based methodologies and inclusion of acceptable quality assurance/quality control procedures. Monitoring data should be reviewed periodically to ensure compliance with permit limits and to track trends in effluent and receiving water quality.

7B. ACTION PLAN

FOR

MANAGING ON-SITE SEWAGE DISPOSAL SYSTEMS

In areas that are not served by a centralized sewage treatment facility, wastewater generated by residents and businesses often must be disposed of on the premises. Homes and businesses in many areas of the Massachusetts Bays region dispose of their sewage through on-site systems, including parts of the South Shore, most of the Upper North Shore, and virtually all of Cape Cod. These same areas have generally experienced the greatest population growth over the last 20 years. As the population in unsewered rural and suburban areas continues to expand, it becomes increasingly important to find ways to limit the adverse impact of these systems on the coastal environment.

On-site sewage disposal systems (OSDS), such as septic tanks and cesspools, remove pathogens from waste by two mechanisms -- physical straining and adsorption or adherence to soil particles. Most of these systems temporarily store wastewater and then gradually allow it to leach into surrounding soils. As the sewage percolates through the soil, much of the bacteria is filtered out, allowing relatively clean water to pass through to the groundwater below.

Three physical factors govern the placement of a septic system:

- (1) the elevation of the site above groundwater;
- (2) the lateral distance between the leaching component of the system and a point of water use (e.g., drinking water well); and
- (3) the suitability of the soils or sediments into which the effluent will be discharged.

In Massachusetts, all of these factors are addressed by the Title 5 regulations of the State Environmental Code, most recently revised in March, 1995. Unfortunately, many on-site systems pre-date both the current Title 5 regulations and the previous (1978) regulations, and are severely degrading coastal habitat and nearshore waters in the Massachusetts Bays region.

There are three ways in which pathogen contamination from on-site systems can reach the coast. The most obvious threat is outright system failure, which occurs when a system

component is blocked by accumulated solids or when receiving soils become saturated. With no place else to go, sewage collects on top of the septic system, cesspool, or leaching structure. If it breaks onto the surface of the ground, the sewage may eventually be carried to receiving waters by stormwater runoff or gravity. Systems installed before the promulgation of the 1978 Title 5 may have little or no separation from groundwater and may therefore cause contamination even if the sewage does not emerge onto the ground. These "covert" system failures are especially insidious because they give no obvious visible indication of the harm being done.

During dry weather, system failures probably contribute only a small amount of pathogen contamination to the Bays. During periods of wet weather, however, system failures are more frequent and may be a locally significant source of coliform bacteria in some coastal areas. Wet weather also triggers overflows in some older systems. Although they are illegal now, many pre-Title 5 systems were equipped with overflow pipes to prevent aesthetically unpleasant system failures. When the wastewater in these systems backs up to a critical level, it is diverted through the overflow pipe, which usually empties directly into a surface waterbody or a connecting ditch. Existing overflow connections are thought to contribute significantly to pathogen contamination in coastal waters and their tributaries.

Even when they meet current design standards, are operating properly, and are properly maintained, however, on-site sewage disposal systems may threaten water quality. Studies suggest that, in most instances, soils filter bacteria out of wastewater over a distance of a few yards. However, viruses -- which are typically much smaller than bacteria -- may pass through these soils and enter the groundwater. They subsequently contaminate resource areas (aquifers, shellfish beds, swimming beaches) which intersect the groundwater flow. Depending on the horizontal distance between an on-site sewage system and the shore, sewage-derived pathogens may contaminate coastal waters and habitat.

In addition, on-site sewage disposal systems can be a significant source of nitrogen. Soil infiltration generally does not remove nitrogen effectively from the effluent. Instead, the soil merely converts ammonia nitrogen to potentially harmful

nitrates. Excessive nitrates not only can contaminate drinking water supplies, but also can stimulate excessive growth of algae in nitrogen-sensitive embayments.

On-site sewage disposal systems also may contribute toxic and corrosive contaminants from household cleaning and maintenance products. While quantitative data are not available to conclusively establish the relative magnitude of septic systems as a source of toxicants to water resources, efforts need to be made to reduce the use of household contaminants in order to better protect the environment and to increase the longevity of the disposal systems.

Prior to their recent revisions, the Title 5 regulations were not sufficient to prevent serious coastal degradation from on-site sewage disposal systems. Originally, the Title 5 regulations were adopted as *minimum* standards of protection. Many homeowners and real estate developers, however, misconstrued them as *adequate* standards of protection. In light of scientific gains made since Title 5 was promulgated in 1978, the regulations have been substantially revised to better protect public health and the marine environment. Some of the positive changes include:

- Required system inspection by a certified inspector at the time of property transfer, change of use that results in increased sewage flow, or increase in the number of bedrooms.
- Clarified definition of a failed system - i.e., a system exhibiting obvious hydraulic failures (breakout or backup of sewage); systems located within Zone I of public water supply wells, within 100 feet of public water supply reservoirs, or within 50 feet of surface water bodies; cesspools without at least a half-day capacity; systems found to be a specific health or environmental threat.
- Nitrogen loading limits for new systems to be served by both on-site systems and private wells, and for systems located in nitrogen-sensitive areas (zones of contribution of public drinking water supply wells). Designation of other nitrogen-sensitive areas will occur through the surface water quality standards process.
- A comprehensive system for review and approval of alternative technologies, based on the level of information available about the proposed technology. For example, recirculating sand filters are approved for general use, and humus/composting toilets, already approved wherever a conventional system could be used, are approved for upgrades, with use of existing leaching systems under some conditions.

No matter how positive these and other changes to the state regulations, mitigating the impact of on-site sewage systems will require the broad cooperation of municipalities and individual homeowners. Fortunately, some remediation

measures are easy to implement. Many conventional system failures, for example, can be prevented simply by pumping out the solids that collect in the septic tank during routine system maintenance.

New technologies also promise to mitigate the impact of on-site sewage systems. Innovative on-site treatment systems have shown considerable promise in removing significant amounts of nitrogen from wastewater. Some of the most promising technologies include:

- *Humus/composting toilets*: composting of sanitary wastes has been used since the dawn of civilization. Its principle is simple. If sanitary wastes are allowed to sit long enough, perhaps with a little added organic matter such as leaves or sawdust, it will eventually degrade to a soil-like material. There have been several drawbacks to this approach, however. Odors, exposure to pathogens, and general unsightliness have historically limited its use to situations where these objections could be overcome. Recently, Clivus Multrum has packaged this technology to address health and aesthetic concerns. Clivus's composting technology is presently approved for use in Massachusetts under certain conditions. This technology has been combined elsewhere with other technologies such as sand filters and standard leaching facilities; however, this "combined" approach has not yet been tried in Massachusetts.
- *Peat filters*: in these systems, peat bed filters are placed after the septic tank and function as both a filter and leach field. As wastewater moves through the peat, microscopic fungi transform nitrates to harmless nitrogen gas. Peat beds require little maintenance and can remove more than 90 percent of the total nitrogen in the wastewater flow.
- *Recirculating sand filters (RSFs)*: these systems are equipped with a series of sand filters. Wastes from the house are first discharged into a septic tank, where solids are separated from the liquid portion of the wastes. Effluent from the septic tank then flows into a pump chamber. From there, the wastes are periodically pumped to the top of a sand filter. After percolating through the sand filter, the effluent is collected by an underdrain and either recirculated back to the pump chamber or discharged to a standard leaching facility. The majority of the effluent collected at the bottom of the sand filter is usually returned to the pump chamber by gravity flow. RSFs are typically designed to recirculate effluent three to five times before discharging to the leaching facility.
- *RUCK systems*: like filter systems, the RUCK system relies on bacteria to convert ammonium first to nitrate and then to nitrogen gas. It incorporates separate septic tanks for black and gray water. A special filter aerates

and nitrifies the black water, which is then mixed with the gray water in an anaerobic environment. At this stage, bacteria draw carbon from the gray water, allowing them to convert nitrate to nitrogen gas. The combined effluent is then discharged to a standard leaching facility.

While the cost of these systems may be beyond the immediate reach of many home owners, low-interest "betterment" loans are expected to become increasingly available as more and more communities take advantage of the recent betterment law that enables communities to offer loans for on-site system upgrades, lead paint abatement, and removal of underground fuel tanks. Additional assistance is available from a \$10 million loan program, to be administered by the Executive Office of Communities and Development (EOCD), the

Farmers Home Administration (FmHA), the Massachusetts Housing Finance Agency (MHFA), and some private lending institutions. Also, with increased use of alternative systems, costs should fall. In the meantime, homeowners need to be educated about their on-site sewage systems in order to keep them functioning properly. At the same time, town officials, particularly local Boards of Health and health agents, need reliable up-to-date information on alternative technology systems and direct "hands-on" technical assistance in evaluating on-site systems proposals and monitoring alternative systems performance. Working together, state officials, local officials, and private homeowners can ensure that our coastal resources are not degraded by sewage-derived contaminants.

MUNICIPAL ACTION #7B.1:

Municipalities should identify resource areas sensitive to wastewater and develop management plans appropriate to these areas, focusing on the capacities of natural systems to assimilate wastewater.

RATIONALE:

In many Massachusetts coastal communities, groundwater is both a source of drinking water and a receptor for wastewater. Septic systems located in areas of high groundwater, in recharge areas to freshwater ponds, and in recharge areas to sensitive coastal embayments can seriously degrade water quality, resulting in an array of problems, including closed shellfish beds and excessive plant growth and odor in ponds and coastal waters.

By identifying their wastewater-sensitive resource areas (e.g., wellhead protection areas, potential public water supply areas, recharge areas to freshwater ponds, recharge areas to nitrogen-sensitive coastal embayments, areas where groundwater has been degraded by point and nonpoint source pollution), municipalities can better manage wastewater and minimize adverse impacts on groundwater and surface water quality.

Once these individual resource areas are identified, municipalities can develop appropriate sub-area management plans that specify permissible and prohibited activities based on the specific resource and public health interests to be protected. For example, specific limits can be set on nitrogen discharges from new development or redevelopment sites in order to protect the quality of drinking water supplies in wellhead protection areas or to prevent excessive plant growth in coastal waters. Strategies to achieve and maintain safe nitrogen levels may include: zoning changes to increase minimum lot sizes, restrictions on selected land uses that generate high nitrogen loads, use of denitrifying wastewater treatment systems, and land acquisition.

One important note: This recommendation can and should be considered a *minimum* level of planning needed to protect specific embayments and other sensitive areas from wastewater-related nutrient and pathogen impacts, especially for existing development. In many cases, municipalities will need to undertake a more comprehensive level of planning related to wastewater management and the potential impacts associated with wastewater discharge. This is particularly true for impacts from new development or in densely developed areas adjacent to sensitive resource areas. Please refer to Action Plan 7C regarding Decentralized Wastewater Management for additional information on these broad criteria.

RESPONSIBLE AGENT(s):

Planning Boards and Boards of Health would share most of the responsibility for this action, with assistance from local Conservation Commissions and Water Departments, Regional Planning Agencies, and the Massachusetts Departments of Environmental Protection (DEP) and Environmental Management (DEM). Where management areas cross town boundaries, municipalities should work cooperatively with their neighboring communities and RPAs to ensure the effective management of wastewater at the regional level.

IMPLEMENTATION STRATEGY:

Local boards, assisted by the RPAs, should obtain and evaluate relevant information on sensitive resource areas in the community. Sources of such information include local records and file data developed by the Departments of Environmental Protection and Environmental Management (e.g., Areas of Critical Environmental Concern, wellhead protection areas, potential public water supply sites, Outstanding Resource Waters, wetlands). Information on existing and potential wastewater problem areas may be obtained from Board of Health septic system pumping and repair records, local water table maps, local land use maps, and Planning Board records on existing and proposed development sites.

The local boards and RPAs should involve the citizenry in discussions of wastewater management alternatives and of the treatment level needed to achieve and maintain a specified environmental quality under different development scenarios, so that costs and benefits can be properly weighed by the community as a whole. Each alternative will carry with it certain public and/or individual resident costs and benefits. Understanding these costs and benefits can be key to obtaining public support for a particular management scheme.

Technical assistance in developing the sub-area management plans may be obtained from the RPAs, the DEP Division of Water Pollution Control, the Massachusetts Bays Program, the Massachusetts Coastal Zone Management Office, the EPA's Small Flows Clearinghouse, and the Massachusetts Water Resources Authority (for member municipalities). In

addition, helpful information may be available from EPA's two regional demonstration projects -- the City of Gloucester and the Waquoit Bay National Estuarine Research Reserve -- on alternative on-site wastewater technologies and other strategies for minimizing the impacts of wastewater on groundwater and surface water quality.

LEGISLATION REQUIRED:

New legislation is not required at this time.

ESTIMATED COST:

The costs of this action can vary widely depending upon the level of information available. For municipalities with computerized assessor's records, digitized parcel information, and completed water studies, this action could cost under \$50,000. If such information is not available, costs could exceed \$250,000. (Although not as detailed or reliable, the so-called "MacConnell land use data" could be used in place of parcel data.)

The cost also is dependent upon the specific resources to be protected. For example, it may cost significantly more to define and map the recharge area of a nitrogen-sensitive embayment than to delineate the wellhead protection area around a single well site.

POTENTIAL FUNDING SOURCE(s):

Currently, funds for the development of local sub-area management plans must come largely from local revenues. Technical assistance (and in the case of the Cape Cod Commission, limited funding) may be available from the RPAs. Some s.319 (Nonpoint Source Program) funds may be available on a competitive basis from the DEP. Additional state funding may be available in the future if proposed legislation to provide funding for the preparation of Local Comprehensive Plans passes. A local sub-area management plan could be part of a Local Comprehensive Plan.

TARGET DATE:

1996 - 2001.

FURTHER INFORMATION:

For further information and assistance, contact:

Your area's Regional Planning Agency

MUNICIPAL ACTION #7B.2:

Municipalities, in cooperation with DEP, should develop and implement regular inspection and maintenance (I/M) programs for on-site wastewater systems.

RATIONALE:

Improperly operated and maintained septic systems can pollute groundwater and streams, ponds, and coastal waters. Such pollution can result in the closure of shellfish beds and noxious water quality conditions in ponds and coastal waters. Over the long term, chronic pollution of water resources from on-site septic systems can force a municipality to construct costly water and wastewater treatment facilities that would not have been necessary had the community's septic systems been properly maintained.

Preventive measures, such as a regular septic system inspection and maintenance (I/M) program can help assure the proper operation of septic systems and protect environmental quality and public health. It also provides an opportunity to educate homeowners about the proper use and disposal of household chemicals that are harmful to septic systems and groundwater. An inspection and maintenance program can be an effective tool for improving the overall quality and performance of on-site wastewater systems within a given resource area or in the community as a whole. Depending upon the nature of the areas in which systems are located, required upgrades might include denitrifying systems or community systems where lot size limitations preclude constructing conventional systems to code.

RESPONSIBLE AGENT(s):

A septic system I/M program may be conducted by either an individual community or a group of communities (the latter by establishing an institutional mechanism for joint management and funding, such as a groundwater protection district). In either case, the I/M program should be conducted in consultation and cooperation with the Department of Environmental Protection (DEP). In some regions, organizing a program through the wastewater treatment facility or a county entity may be desirable. Individual programs would generally be administered by the Board of Health and/or DPW. Regardless of how a program is organized, each community would be individually responsible for issuing the appropriate enforcement orders to homeowners whose systems warrant pumping, repair, or an upgrade.

IMPLEMENTATION STRATEGY:

A municipality should decide how it wants to conduct its I/M program - on its own or in cooperation with other local or regional governments. The municipality also should evaluate the capacity of the local or regional wastewater treatment facility to handle additional septage. Once these are accomplished, establishment of an inspection and maintenance program is a relatively straightforward matter.

The I/M program would notify each homeowner prior to an inspection, and the homeowner would be expected to expose the manhole cover of the septic tank or cesspool. The inspection would involve examining the system for visible signs of failure, inspecting the tees and depth of the manhole cover, measuring the thickness of the scum and sludge layers relative to the volume of the septic tank or cesspool, and recording the pH. The inspector would be available to discuss the inspection results with the homeowner and to provide educational materials on proper system operation and maintenance.

Within 3 weeks or so of an inspection, a formal findings letter and a copy of the completed inspection form would be mailed to the property owner. The notice would state if the system is in compliance with applicable local and state regulations or whether pumping or an upgrade is required. The local boards of health would be responsible for implementing enforcement orders issued as a result of the inspections.

The I/M program staff would maintain a computerized database of all inspections and pumping data, and this information would be readily available to local boards of health and health officers. Inspections would be scheduled such that each residential system would be examined once every three years. Commercial systems, such as restaurants and laundromats, would be inspected more frequently, perhaps once every 6 months to a year, depending on local factors.

Other considerations would include current inspection and maintenance related efforts (e.g., a paper describing I/M options) by the DEP.

LEGISLATION REQUIRED:

The adoption of a uniform annual fee for all owners of on-site systems requires special state legislation. The establishment of a regional groundwater protection district between or among municipalities also requires special state legislation.

ESTIMATED COST:

Variable, depending on number of on-site systems and institutional mechanism selected (i.e., local program vs. share intermunicipal program).

POTENTIAL FUNDING SOURCE(s):

Local sources of funds include: property tax revenues, treatment plant discharge fees, and system user fees. As an example, under the City of Gloucester's Wastewater Management Program, each on-site system owner is charged an annual fee ("on-site monitoring fee") that appears on the water bill. The collected fees are deposited into an enterprise fund which is used exclusively for activities associated with

the Wastewater Management program. At the end of each fiscal year, any money left in the fund does not revert to the General Fund but remains available for increased program staff or services, rate reduction, or for repairs of on-site systems performed on behalf of an owner experiencing an emergency or financial hardship.

TARGET DATE:

1996 - 1998.

FURTHER INFORMATION:

For further information and assistance, contact:

DEP Division of Water Pollution Control
(617) 292-5673
Your Area's Regional Planning Agency

MUNICIPAL ACTION #7B.3:

Municipalities should employ full-time, professionally-trained public health staff to provide ongoing technical and administrative support to the local Boards of Health.

RATIONALE:

Local Boards of Health have both a broad responsibility and far-reaching authority to protect the health, safety, and welfare of a community's residents. Their broad regulatory authority has thrust them into the forefront of public health and environmental protection at the local level. Indeed, Boards of Health can adopt regulations for virtually any activity that might endanger public health or contaminate the soil, air, or water, including groundwater. Major oversight responsibilities include, but are not limited to:

- Regular sanitary inspection of all food handling establishments, schools and day care centers, hospitals, convalescent facilities, and nursing homes, summer camps, and theaters;
- Investigation of all complaints of nuisance or unsanitary conditions;
- Local enforcement of the state's "Right-To-Know" law;
- Siting and regulation of solid waste facilities, including landfills and recycling centers;
- Review of subdivision and site plans (drainage and waste disposal considerations);
- Water quality testing of public swimming beaches; and
- Review and permitting of septic system installations and upgrades (including witnessing of percolation and deep hole tests).

With respect to the latter responsibility alone, the complexities and demands of the recently revised Title 5 regulations are expected to place an extremely heavy burden on many local health boards, requiring an investment of time and a technical understanding of on-site systems, including alternative systems, that are generally not available through a board's all-volunteer members or a part-time health agent. For this reason, Boards of Health should hire full-time professionally trained staff (preferably a registered sanitarian or engineer) who can devote full attention to carrying out the Boards' multiple environmental and public health mandates.

RESPONSIBLE AGENT(s):

The Boards of Health, supported by other municipal boards, would have primary responsibility for this action.

IMPLEMENTATION STRATEGY:

The Board of Health, in consultation with the community's finance board and chief governing body, would request approval of an expanded annual operating budget to accommodate the new staff position(s). Approval would be by either town meeting or city council vote, depending on the local government structure.

The Massachusetts Association of Health Boards, the Massachusetts Public Health Association, and the Massachusetts Municipal Association can offer guidance in developing job descriptions and advertising the new position(s) to attract qualified candidates.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

The cost associated with hiring a full-time health agent (registered sanitarian or engineer) is \$35,000 - 40,000 per year including benefits, overhead, professional membership fees, travel, and other expenses.

POTENTIAL FUNDING SOURCE(s):

Local revenues and fees from sanitary inspection services.

TARGET DATE:

1996/1997 to hire full-time staff.

FURTHER INFORMATION:

For further information and assistance, contact:

Massachusetts Association of Health Boards
(508) 643-0234
Massachusetts Public Health Association
(617) 524-6696
Massachusetts Municipal Association
(617) 426-7272

COASTAL RPA ACTION #7B.4

Coastal Regional Planning Agencies should establish a Title 5 and alternative systems technical assistance program directed to local Boards of Health and health agents, systems engineers/installers, and homeowners.

RATIONALE:

In 1994, the Massachusetts Bays Program convened a "focus group" meeting on the local management of on-site sewage disposal systems. The purpose of this meeting was to learn first hand from local Boards of Health and others about the problems they encounter in administering Title 5 and the types of outside assistance that would prove most beneficial to them.

The participants noted the lack of direct ("hands-on") technical assistance available to local boards on a regular and timely basis to help set up inspection and maintenance (I/M) programs, perform technical reviews of advanced on-site wastewater treatment systems plans, develop protocols for local oversight of the operation and maintenance of alternative wastewater treatment technologies, and provide training for on-site systems installation and monitoring.

To address this need, it was recommended that the Regional Planning Agencies establish a direct and ongoing technical assistance service in each of the coastal regions where on-site sewage disposal is the dominant or a significant mode of wastewater management.

An excellent model for this latter service is already in place on Cape Cod. Since April 1994, the Barnstable County Department of Health and the Environment (BCDHE) has employed a part-time registered sanitarian, paid for by the MBP, to provide ongoing technical assistance to Boards of Health, installers, and others on alternative technologies and related matters. During this brief period, this individual has:

- developed expertise and compiled a reference library on alternative systems technologies;
- provided technical assistance to Boards of Health and engineers in the review of plans for non-proprietary systems;
- assisted in the installation of a peat system (Cotuit);
- assisted in the monitoring program for a recirculating sand filter (Bourne);
- developed standardized monitoring requirements for the provision of performance data on alternative systems; and

- developed fact sheets for Boards of Health, homeowners, and engineers/installers on composting and recirculating sand filter systems.

Building on the first year's accomplishments, BCDHE plans to offer additional services in several other areas as well, including:

- conducting hands-on training on alternative technologies with each Board of Health;
- working directly with Boards of Health to adopt standardized monitoring requirements for alternative technologies;
- developing additional fact sheets on peat systems, determination of system efficiencies, and the denitrification process; and
- developing and distributing newsletters offering timely information and advice on on-site systems issues.

From the local perspective, hands-on assistance of this kind is indispensable and can only be provided by trained personnel physically located in or near the communities to be served. For this reason, it is important that these same technical services be made available in the other coastal regions where undertrained and overburdened Boards of Health are attempting to grapple with a broad range of difficult on-site sewage systems management problems.

RESPONSIBLE AGENT(s):

The three RPAs serving the non-sewered coastal communities of the North and South Shores [Merrimack Valley Planning Commission (MVPC), Metropolitan Area Planning Council (MAPC), and Old Colony Planning Council (OCPC)] would be responsible for providing the direct technical assistance, training, and educational outreach to local Boards of Health, health agents, on-site systems engineers/installers, and homeowners. As mentioned above, Cape Cod communities are already offered these services by the Barnstable County Department of Health and the Environment.

IMPLEMENTATION STRATEGY:

The three coastal RPAs should adopt the successful model program established by the Barnstable County Department of Health and the Environment.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

The cost to the coastal RPAs of providing ongoing technical assistance to local Boards of Health and others on on-site systems matters, including alternative technologies, is expected to be about \$25,000 - \$35,000/RPA per year. This would support the part-time position (approximately 20 hrs/wk) of a trained specialist (e.g., environmental engineer or registered sanitarian) to provide ongoing professional assistance to the non-sewered coastal communities on the North and South Shores.

POTENTIAL FUNDING SOURCE(s):

Potential funding sources include Section 319 (nonpoint source) funds and RPA matching funds.

TARGET DATE:

Due to the scope and immediacy of on-site system problems and needs in many of the region's coastal communities, planning for the RPA technical assistance services should begin as soon as possible, with full implementation proposed for 1996/1997.

FURTHER INFORMATION:

For further information and assistance, contact:

Your Area's Regional Planning Agency:

Merrimack Valley Planning Commission
(508) 374-0519
Metropolitan Area Planning Council
(617) 451-2770
Old Colony Planning Council
(508) 583-1833

DEP ACTION #7B.5:

The Department of Environmental Protection should evaluate and build upon the centralized statewide repository for testing information on alternative technologies, to be established as part of the Buzzards Bay Project's two-year Environmental Technology Initiative Project.

RATIONALE

Keeping informed about the efficiency and site-specific applicability of on-site alternative technologies poses a special challenge to local officials administering Title 5. Boards of health and other community representatives have identified the need for a centralized bureau or service that they can consult for reliable, up-to-date information and advice on evaluating and choosing appropriate alternative technologies to protect nitrogen-sensitive embayments and groundwater.

To address this problem, a state/local focus group convened in 1994 by the Massachusetts Bays Program recommended that the state (preferably DEP) establish a central clearinghouse for all relevant information on alternative technologies. The information to be collected should be comprehensive, up-to-date, and easily accessible (i.e., user friendly). Moreover, to the extent possible, the clearinghouse should be linked electronically to other data sources, researchers and users (e.g., the National Small Flows Clearinghouse at West Virginia University, Waquoit Bay National Estuarine Research Reserve) to facilitate information transfer and use.

In the summer of 1995, the Buzzards Bay National Estuary Project, in collaboration with Barnstable County Department of Health and the Environment (BCDHE), the Massachusetts Department of Environmental Protection, Woods Hole Oceanographic Institution, and Waquoit Bay National Estuarine Research Reserve, was awarded an EPA Environmental Technology Initiative (ETI) grant for \$459,000. The funding will support a two-year project involving the development of a testing and demonstration facility for alternative design systems in the Buzzards Bay area. The project will provide a centralized testing facility which will demonstrate the technologies to local boards of health and system design professionals. The project will also provide a centralized statewide repository for testing information on alternative technologies, which will help encourage their use and acceptance regionally and perhaps even nationally. This project can serve as a model for the DEP alternative technologies clearinghouse recommended by our local focus group participants.

RESPONSIBLE AGENT(s):

During the two-year ETI project, the Barnstable County Health and Environment Department will serve as the statewide repository for testing information on alternative technologies. The information will be available both electronically and in hard-copy format. At the conclusion of the project, DEP should evaluate the effectiveness of and demand for a centralized clearinghouse, and should accept the responsibility for maintaining the service statewide.

IMPLEMENTATION STRATEGY:

DEP/DWPC should work closely with the Buzzards Bay Project and the other ETI partners throughout the two-year project. At the conclusion of the project, DEP should convene a small working group of representative "stakeholders" to help evaluate the effectiveness of the types of information provided by the ETI project's statewide repository of testing information and the delivery system used.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

The overall cost of DEP's establishing and maintaining a central clearinghouse of on-site systems technologies is yet to be determined. Evaluation of the level of effort necessary to maintain the ETI project's centralized statewide repository for testing information should help determine the cost of a long-term centralized clearinghouse.

POTENTIAL FUNDING SOURCES:

Potential funding sources include: DEP's annual operating budget and Section 319 (nonpoint source) funds.

TARGET DATE;

The ETI model project will begin in 1996 and conclude in 1998. DEP evaluation of the clearinghouse function will take place throughout the project, with a follow-up DEP implementation strategy in place at the conclusion of the project.

FURTHER INFORMATION:

For further information and assistance, contact:

DEP Division of Water Pollution Control
(617) 292-5673

7C. ACTION PLAN FOR DECENTRALIZED WASTEWATER MANAGEMENT AND TREATMENT

NOTE TO THE READER: THE FORMAT OF THIS PLAN DOES NOT FOLLOW THE FORMAT OF THE OTHER ACTION PLANS, AS THE BASIS FOR THE DECENTRALIZED ACTIONS IS UNDER DEVELOPMENT. UPON COMPLETION OF THIS WORK, AS DESCRIBED IN THIS PLAN, MORE SPECIFIC ACTIONS WILL BE RECOMMENDED BY THE MASSACHUSETTS BAYS PROGRAM.

BACKGROUND

As described in the previous Action Plans (Managing Centralized Wastewater Treatment Facilities and Managing On-Site Sewage Disposal Systems), the disposal and subsequent treatment of wastewater in most communities and regions of Massachusetts occurs via either centralized sewage treatment plants or standard design on-site sewage disposal systems (OSDSs). While each method employs a range of technologies, the methods themselves can possibly create impacts or otherwise be limiting.

The possible effects of centralized systems are summarized as follows:

- hydrologic imbalances in watersheds where water use is far upstream from its ultimate discharge as treated effluent;
- end-of-pipe controls are the norm and are more expensive than a pollution prevention approach;
- land is opened for development which might not have been otherwise developable, and which may contain or is protective of sensitive natural resources; and
- eutrophication of receiving waters, due to nutrient enrichment of the effluent.

The potential impacts of standard design OSDSs are summarized as follows:

- contamination by bacteria, viruses, and/or nutrients of downgradient or downstream receiving water, resulting in shellfish bed closures and eutrophication; and
- inadequate inspection and maintenance, which are critical to optimal OSDS functioning.

Recognizing that these methods work best in specific and somewhat limited situations, the Ad Hoc Task Force for Decentralized Wastewater Management (the "Task Force")

began meeting several years ago to explore wastewater management methods which fall "in between" centralized treatment and standard design OSDSs. These decentralized methods can include package treatment plants; waste grinder/STEP systems; innovative/alternative OSDSs; and/or management districts to oversee the regular operation and maintenance of these technologies. The Task Force consists of representatives from the MBP, Massachusetts DEP, coastal communities, wastewater engineers, and a number of non-governmental organizations (NGOs). Similarly, the Task Force has sought funding and support from a number of sources; grantors include the MBP and EPA's Environmental Technologies Initiative (ETI). Finally, in exploring and articulating decentralized methods, a principal goal of the Task Force has been to insure that its efforts complement and otherwise fit with the existing permitting and financing frameworks which apply to centralized systems and standard design OSDSs. As previously noted, these two methods currently in use in Massachusetts for managing wastewater will continue to be viable options for managing wastewater in many areas.

The following sections describe the Task Force's efforts in greater detail, including expected benefits, progress to date, remaining work, and recommended actions.

DESCRIPTION:

A decentralized approach to wastewater management can include a range of methods to collect and treat wastewater, as well as to manage these methods. The decentralized approach provides a municipality (ies) with the ability to address environmental and health concerns with technological and management systems specific to those concerns. For example, portions of a community currently serviced by standard design OSDSs may continue using those technologies, while more densely developed areas of the community may be serviced by a collection and treatment system. Further, all of the community or only portions of it may be

served by a management district that has the responsibility for inspection and maintenance of the systems, and for assessing fees to pay for these services. This contrasts with the centralized approach in which the community may identify specific environmental and health concerns; however, one wastewater treatment facility is usually constructed to address these concerns, with the entire municipality sewered to transport all or most of its wastewater to that one facility. The Task Force recognizes that when choosing among wastewater management options, municipalities should give careful consideration to current and future growth management strategies, based on their community's natural resource capacities and the local commitment to achieve and maintain a certain minimum level of environmental quality. Decisions about growth management and development will influence what wastewater treatment solutions are viable, desirable, allowable, and environmentally appropriate within a particular community.

To date, the Task Force has funded the development of two major "white papers" on the needs assessment and management aspects of the decentralized approach. In addition, the Task Force held a major regional conference in December, 1995, whose goal was to provide attendees the opportunity to hear national experts speak on the assessment, management, and siting/design aspects of the decentralized approach. The following subsections characterize the papers and summarize the conference outcomes; further efforts planned by the Task Force are described in the "Work to be Completed" section.

Needs Assessment and Evaluation of Decentralized Wastewater Treatment Alternatives

As articulated in this paper, the goal of assessment and evaluation should be the production of a comprehensive "Facilities and Management Plan" (FMP). The FMP considers the physical, social, economic, environmental, and other related characteristics in making decisions regarding the construction, operation, maintenance, and financing of a wastewater management system for the study area. The components of the process leading to adoption of the FMP are summarized as follows:

- development of a plan of study, to guide the efforts by parties responsible for the FMP, including local officials, federal and state regulators, regional representatives, and the affected public;
- assessment of wastewater treatment needs, which is a major and thorough evaluation of the study area's demographic, environmental (e.g., geology, soils, water resources, etc.), and infrastructure (e.g., wastewater treatment) conditions - existing and future;
- development and screening of wastewater treatment options for the study area, addressing various technologies, technological and administrative considerations, and

screening of criteria such as regulatory, management, environmental, and financial; and

- detailed evaluation of options and development of a plan for the study area, assessing the criteria from the previous step, and recommending a plan and its components.

Managing Wastewater: Prospects in Massachusetts for a Decentralized Approach

The white paper for management of decentralized wastewater technologies describes the issues and elements applicable to this aspect of the decentralized approach. In particular, once a community has accepted its FMP, it can use these management approaches to facilitate the operation and maintenance of the selected decentralized technologies. Accordingly, the potential utility for these management approaches in Massachusetts is also discussed. The following bulleted items summarize the major considerations related to management of decentralized technologies in Massachusetts:

- a wastewater management entity may take several different forms, such as an administrative or governmental body, and it may be public and/or private;
- a management entity will have financial responsibilities (e.g., administration of capital and operating costs) and regulatory responsibilities, such as permit monitoring, inspection, pumping, maintenance/repair, record keeping, and enforcement;
- in selecting a management entity, considerations relate to both the outcomes of the FMP (e.g., demographics, location of sensitive areas) and institutional issues, such as political acceptability and accountability to members of the management entity; and
- statutory, especially that legislation does not exist to enable management of wastewater technologies.

Managing Small-Scale, Alternative and On-Site Wastewater Systems: Opportunities, Problems, and Responsibilities.

This conference was held in Worcester, Massachusetts on December 1 and 2, 1995, and featured both national and regional experts in the field of decentralized wastewater management. The over 200 attendees (local officials, non-profits, regulators, and designers) were provided with the opportunity for large and small group discussions of decentralized wastewater management solutions. These discussions identified the following major needs in Massachusetts:

- continued communication and coordination among regulators, communities, and designers, especially regarding the need for broad enabling legislation. (Many felt the conference was just a start to communication);

- technical assistance, particularly to communities, by a neutral (i.e., non-regulatory) third party; and
- a "trail blazer" community or organization to overcome existing barriers by establishing some type of wastewater management district, within current state law.

Overall, Conference attendees supported the decentralized approach, and encouraged the Task Force to pursue fulfillment of the needs identified above, since attainment of these is critical to the success of decentralized wastewater techniques and, ultimately, to improved environmental protection.

EXPECTED BENEFITS

The advantages to adopting a decentralized approach to wastewater management include financial, environmental, and social benefits.

With respect to the environmental advantages of a decentralized approach, a community can identify its sensitive natural resources and utilize technologies appropriate for the needs of those areas. For example, a coastal area adjacent to an embayment which may be prone to eutrophication should employ nitrogen-reducing techniques rather than use standard design OSDSs, which can create unacceptable nitrogen loads to receiving waters.

Social benefits of a decentralized approach include increased responsibility for those who own a wastewater treatment structure, since they may be required to regularly maintain certain components, participate in governance of the management entity, or even pay increased costs. Often with either centralized or standard design OSDSs, an "out-of-sight, out-of-mind" mentality exists on the part of the owner.

Financial benefits result when communities can apply more resource-intensive management techniques to those areas which require it (e.g., downtown areas with high density/poor soils and a high rate of OSDS failure), while applying more standard techniques in other areas. This is in contrast to a centralized collection and treatment system which would apply to a much larger area at a much higher overall cost.

PROGRESS TO DATE

As previously described, the Task Force has succeeded in bringing together all levels of government, consultants, and NGOs in developing a decentralized approach to wastewater

management. This approach will provide wastewater treatment and management alternatives to those widely used in Massachusetts at present: centralized collection/treatment and standard design OSDSs. In its current form, the decentralized approach includes two white papers regarding the assessment and management aspects of the approach, as well as the major regional conference held in December 1995.

WORK TO BE COMPLETED

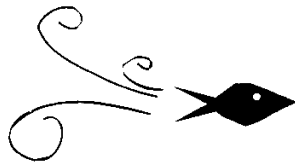
Upon completion of the two white papers and the conference, the Task Force is planning three additional efforts to support the decentralized approach. First, two more papers will be written: one to outline site design and engineering considerations for decentralized systems, and another to review the conditions under which management entities around the country are held accountable for the performance of OSDSs. Second, an Executive Summary of all four papers will be written and widely distributed. Third, extensive followup is planned, in the form of workshops to be held across the state for local officials and consultants.

RECOMMENDED ACTIONS

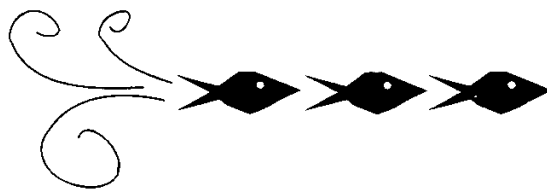
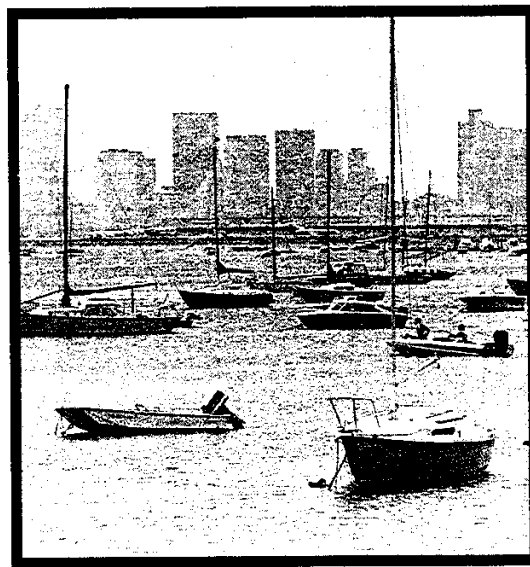
The following recommended actions should be considered both general and preliminary. The MBP intends to continue supporting the development and implementation of this approach and plans to review these recommendations, with the responsible agency, to insure their utility and appropriateness.

- The US Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (DEP) should evaluate their existing permitting and financing programs in order to identify opportunities for the inclusion of decentralized methods;
- The Massachusetts Executive Office of Environmental Affairs (EOEA) should assess current laws and propose changes to the Legislature where needed to enable decentralized management approaches;
- The Massachusetts DEP should foster decentralized approaches through their ongoing work with communities and consultants in managing wastewater; and
- Communities should consider decentralized methods in municipal or area-wide wastewater planning, encouraging citizens, local officials, and consultants to become involved.

chapter V



**Managing Boat
Wastes and Marina
Pollution**



ACTION PLAN #8

MANAGING BOAT WASTES AND MARINA POLLUTION

Tens of thousands of commercial and recreational boats ply the waters of Massachusetts Bays. Discharges of untreated or minimally treated sanitary wastes from these marine craft can be a locally significant source of pathogens in the Bays system. The chemicals used to deodorize and disinfect this sewage -- alcohol, formaldehyde, zinc and ammonium salts, and chlorine -- also degrade marine water quality.

Boat heads (toilets) can either be installed or uninstalled. Uninstalled heads (otherwise referred to as porta-potties), most often used on boats between 18 and 26 feet, are typically self-contained units with a holding capacity of two to five gallons. The head simply stores waste until the boat returns to its slip, where the head can easily be carried off the boat and emptied into a toilet. Unfortunately, these heads can also be easily (and illegally) emptied overboard.

Installed marine heads, which are not removable, are regulated by the U.S. Coast Guard under the terms of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA). Federal regulations require installed heads to be serviced by one of three types of marine sanitation devices (MSDs). Type I and Type II MSDs both macerate and disinfect waste with chemical disinfectants, although the Type II device provides better treatment of fecal coliform and suspended solids. Type III MSDs are holding tanks that allow waste to be stored and released away from shore. These systems typically use formaldehyde, alcohol, or both to deodorize waste while it is stored in the holding tank. Boats larger than 65 feet must use either a Type II or Type III MSD.

Through Title 5 of the State Sanitary Code, the Massachusetts Department of Environmental Protection (DEP) prohibits direct discharges of sewage from portable heads into any marine or fresh water. The Coast Guard permits direct discharges from Type I and Type II MSDs in coastal waters, but prohibits discharges from Type III MSDs in marine waters within three miles of shore.

Unfortunately, illegal discharges from all types of marine heads commonly occur in nearshore waters and harbors. Neither DEP nor the Coast Guard has the personnel to adequately enforce their existing discharge regulations.

Boaters with uninstalled heads, thinking it inconvenient to carry the head from the boat to an onshore toilet, often dump their waste overboard. Boaters with installed heads often do not want to invest the time and effort to get the boat to a marina's pump-out facility. Although the Commonwealth's Chapter 91 regulations give DEP's Division of Wetlands and Waterways (DWW) authority to develop design standards for pump-out facilities at all marinas, DWW has not strictly enforced annual permit requirements and many marinas do not have these facilities. Siting pump-out facilities can be problematic, since few marinas are tied into sewer systems and DEP policy prohibits the discharging of boat waste into a septic system.

Even those marinas that do have pump-out facilities report that the facilities are seldom used. Many boaters simply find it more convenient and less expensive to discharge their waste directly into nearshore waters. Apparently, they do not think that boat wastes seriously degrade water quality, or believe that their own incremental addition is too small to be significant.

While a boat's sewage may *seem* insignificant, the cumulative wastes from many boats may be a significant source of contamination in parts of Massachusetts Bays. However, because of the intermittent, transient, and sometimes covert nature of these discharges, the overall impact of boat wastes to the Bays system is difficult to assess. Generally, the impact tends to be site-specific, although pathogens and chemical disinfectants from boat discharges almost certainly impair water quality to some degree throughout large parts of the Bays system. The greatest impacts occur in embayments and other poorly flushed areas with low dilution.

The Massachusetts Bays Program has launched an initiative to educate boaters about the effects of sewage discharges on water quality in the Bays. While education is helpful, it is not enough. Federal, state, and municipal officials must find effective ways to prevent or minimize boat sewage discharges into Massachusetts Bays. Toward this end, the Federal Clean Vessel Act of 1992 established an opportunity for states to set up grant programs for the construction, renovation, operation, and maintenance of boat pump-out and waste reception facilities at both public and private marinas. CZM

and DFWLE (through its Division of Marine Fisheries [DMF]) completed a needs assessment and developed a plan for the state program according to U.S. Fish and Wildlife Service (USFWS) guidelines. Proposals for funding have been solicited from coastal communities and approximately \$1 million has been released for project construction and implementation.

At the same time, there is a need to control non-sewage contaminants that are generated "land-side" at boatyards and marinas. In particular, stormwater runoff from impervious areas can be a significant water quality concern. Because activities in these areas include the regular transport and

launching of boats, and the servicing of hulls and other boat components, runoff containing oil and grease, metals, paint, and other pollutants has the potential to seriously degrade coastal waters. In recognition of this, CZM and DEP are collaborating on the development of guidance documents that will specifically help marinas and harbormasters to implement the Chapter 91 requirements regarding control of non-point source pollution.

The following recommended actions support these initiatives and provide the framework for more effective management of boat wastes and marina runoff within the Massachusetts Bays region.

MUNICIPAL ACTION #8.1:

Municipalities should work cooperatively with neighboring communities, private boatyards and marinas, and state agencies (DFWELE and CZM) to establish, promote, and maintain *Boat Pump-out Programs* in targeted embayment areas.

RATIONALE:

According to the Division of Marine Fisheries, sewage from boats is discharged regularly into the nearshore waters of Massachusetts Bays. This sewage, together with the chemicals used to deodorize and disinfect it, degrades water quality and contributes to the closure of shellfish beds and swimming beaches. Insufficient pump-out facilities are available to boaters to remedy this problem, and the use of these facilities is currently very low. The reasons for this include inconvenience, cost, and inadequate education and enforcement. Until boat pump-out facilities are available to the boating public at convenient locations and at low or no cost, the problem of unauthorized boat waste discharges is likely to continue.

RESPONSIBLE AGENT(s):

Local Harbormasters, Boards of Health, and Shellfish Wardens would share much of the responsibility for this action. Yacht club, boatyard, and marina owners are responsible in the case of privately-sited facilities.

IMPLEMENTATION STRATEGY:

Establishment of a successful *Boat Pump-out Program* can be a significant undertaking demanding the full commitment of the Harbormaster, Board of Health, and Shellfish Warden. It requires a comprehensive approach involving equal parts facilities siting and operation, public education, and enforcement. It also requires the technical and financial assistance of several state and federal agencies. Toward this end, DFWELE is offering federal pass-through grants to selected municipalities, yacht clubs, boatyards, and marinas to establish *Boat Pump-out Programs* along the coast. DFWELE and CZM have compiled a detailed list of targeted embayments and their individual pump-out needs, based on a survey of existing pump-out facilities, intensity of boat traffic, tidal flushing conditions, presence of marine sanctuaries, proximity to shellfish harvesting areas, and other factors. Municipalities, boatyards, and marinas have been invited to apply for these grants. Grant applications proposing the establishment of mobile, waterborne pump-out facilities, rather than fixed shoreside units, are favored. This is based in part on the successful use of pump-out boats in a number

of harbors in the state, and on the utility and economy of providing pump-out facilities that can be shared by multiple municipalities and/or marinas.

Guidance in establishing an effective local or embayment-level *Boat Pump-out Program* is available from DFWELE, CZM, and DEP.

LEGISLATION REQUIRED:

New legislation is not required. However, in the case of shoreside facilities, several permits and/or licenses will be necessary. For example, sewer connections and/or extensions require a permit from the appropriate DEP Regional Service Center. Holding tanks also require DEP approval, as well as a "Disposal Works Construction Permit" from the local Board of Health.

Installation of a pump-out facility also requires authorization from DEP's Waterways Regulation Program under Massachusetts General Law Chapter 91. This program reviews waterfront construction in or over public waterways and on filled tidelands. A pump-out facility established on a previously licensed site will be considered a minor modification and will not require the submittal of a waterways application if the work is limited to the existing footprint of the licensed facility. Construction of a pump-out facility on an *unlicensed* site will require an application review by the Waterways Regulation Program.

Construction of a shoreside boat pump-out facility also requires some level of review by the local Conservation Commission under the Massachusetts Wetlands Protection Act (WPA), and if applicable, under a local wetlands protection bylaw. Although most work associated with pump-out facilities will take place within protected wetland resource areas or their buffer zones, installation of these facilities will generally not impact resource areas because the facilities will be constructed on existing wharfs, piers, or docks.

ESTIMATED COST:

Boat Pump-out Program costs can vary widely depending on the types of facilities employed, area serviced (i.e., size of harbor and volume of sewage collected), staffing require-

ments, and ultimate disposal costs.

As an example, DFWELE has estimated the following costs for pump-out facilities proposed for Salem Sound (Marblehead, Salem, and Beverly Harbors):

TARGET DATE:

1996/1997. This is a medium to high priority action from a water quality standpoint and should be implemented by targeted municipalities and marinas as soon as federal grant funds permit.

mation that identifies the number and location of recreational boats with type III MSDs in Massachusetts during the boating season, as well as the location of existing pump-out and waste reception facilities. These grants also provide up to 75% funding for the construction of new pump-out and waste reception facilities and for a statewide boater education program. To date, CVA grants have resulted in the placement of over 50 new pump-out facilities in the coastal waters of Massachusetts. However, according to the DFWELE, there is only one more year of funding left in the CVA grants program.

Pump-out Units for Salem Sound (Proposed)	Cost (\$)	Operation and Maintenance (\$)	Waste Reception Units	Cost(\$)	Operation and Maintenance (\$)	Total by Embayment(s)
3 pump-out boats	75,000	2,400	2 floating units	5,000	1,000	111,000
3 shoreside pump-out stations (one with tank, two connected to sewer lines)	(1)11,000 (2)10,000	5,000 4,000				16,000 24,000
						151,000

Most of the cost is the one-time cost of purchasing the pump-out boats and related equipment. The costs of staffing and waste disposal are essential when calculating grant amounts, as these can be used as in-kind expenses.

POTENTIAL FUNDING SOURCE(s):

Section 5604 of the Clean Vessel Act (CVA) authorizes the Director of the U.S. Fish and Wildlife Service, through the DFWELE, to provide grants to coastal and inland states. These grants are be used to develop and refine survey infor-

FURTHER INFORMATION:

For further information and assistance, contact:

DFWELE Division of Marine Fisheries
(617) 727-3193
Coastal Zone Management (CZM)
(617) 727-9530
DEP Division of Wetlands and Waterways
(617) 292-5695

MUNICIPAL ACTION #8.2:

Municipalities, with assistance from CZM and DEP, should require private boatyards and marinas to implement effective stormwater runoff control strategies which include the use of pollution prevention measures and the proper design and maintenance of hull servicing areas.

RATIONALE:

Stormwater runoff occurs from launching ramps, parking lots, and other impervious areas associated with boatyards and marinas. Because activities occurring in these areas include the transport and launching of boats, parking for boaters, and maintenance areas for servicing hulls and other boat components, runoff from these impervious areas may contain oil and grease, metals, paint, and other pollutants which can degrade coastal waters.

RESPONSIBLE AGENT(s):

Local Harbor Commissions, Harbormasters, and Conservation Commissions, with guidance from CZM and DEP, would generally be responsible for assuring implementation of this action. EOE's Office of Technical Assistance (OTA) can provide technical assistance and outreach to boatyard and marina operators.

IMPLEMENTATION STRATEGY:

Chapter 91 regulations require that all existing marinas and boatyards, and any expansions to same, provide adequate facilities for trapping oil and grease, sediment, and paint resulting as by-products from boat servicing, repairs, and construction to prevent discharge to adjacent surface waters [310 CMR 9.39]. These facilities must be described in the application for a Chapter 91 license.

The original statute for Chapter 91 allows the DEP Waterways Program to issue annual marina licenses, although DEP does not presently do so. This mechanism could serve to require stormwater controls for boat maintenance areas through the licensing process. Such a mechanism should not be necessary, however, because the regulations link the licenses and permits to all other environmental programs and requirements [310 CMR 9.33] and all the requirements are already covered.

All of the practices listed in CZM's s.6217 guidance as options for controlling stormwater could be a part of any marina's efforts to meet the license requirements. The DEP

Office of Watershed Management, through its s.319 Nonpoint Source Program, is developing an *Urban Best Management Practices for Massachusetts*, which will provide technical details and design recommendations for acceptable stormwater control practices. The guidance also provides performance standards that must be met, including standards for reducing annual loadings of total suspended solids by 80 percent. The guidance does not mandate the implementation of specific practices, however. All of the DEP performance standards have been established to be consistent with CZM's s.6217 management measure requirements, and the development of this document is being closely coordinated with CZM and other agencies.

The EPA General Stormwater Permit applies only to certain marinas with point source discharges of stormwater, even though the operations and conditions might otherwise be similar to marinas that have overland runoff conditions.

Although not covered by any of the management measures or suggested practices, flooding during high water conditions has the potential to contribute to water quality degradation from contaminants used in marina and boatyard operations. Many marinas and boatyards are located in areas that are flood-prone during spring tide and storm events. Guidance from a CZM-coordinated Flood Plan Task Force has attempted to minimize the potential for pollutant contributions from activities in the coastal flood plain. These standards will be adopted into the marina guidance document on stormwater controls currently being prepared by CZM.

Adequate statutory authority exists to implement marina stormwater runoff controls. To improve implementation, CZM will include information in its marina guidance on stormwater controls and will reference the DEP *Urban BMP Manual*. In addition to coordinating with agency staff, CZM and OTA will provide technical assistance and outreach to marinas on stormwater control efforts. Through a Transportation Bond Bill passed by the Massachusetts legislature, CZM has established a small grants program (the Coastal Pollution Remediation Program) to help communities address stormwater runoff from roads, highways, bridges, and marinas. This program began during 1995 and can provide financial assistance to implement stormwater controls at marina facilities. It is not anticipated that the Waterways

Program will need to use its authority to issue formal annual marina licenses, although this authority will be used to encourage marinas to develop pollution control plans to avoid the necessity of requiring an annual Chapter 91 license.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

The cost of implementing and enforcing boatyard/marina stormwater runoff control strategies locally will vary depending on the number, size, and character of the marina operations within the community.

POTENTIAL FUNDING SOURCE(s):

DEP s.319 Nonpoint Source funds and CZM Coastal Pollutant Remediation (CPR) funds.

TARGET DATE(s):

1996/1997 to develop and issue nonpoint source control guidance for marina operators.

2002 to bring marinas into compliance with site-specific pollution control plans.

FURTHER INFORMATION:

For further information and assistance, contact:

DEP/OWM Nonpoint Source Program
(617) 292-5500

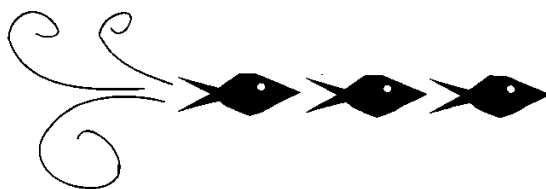
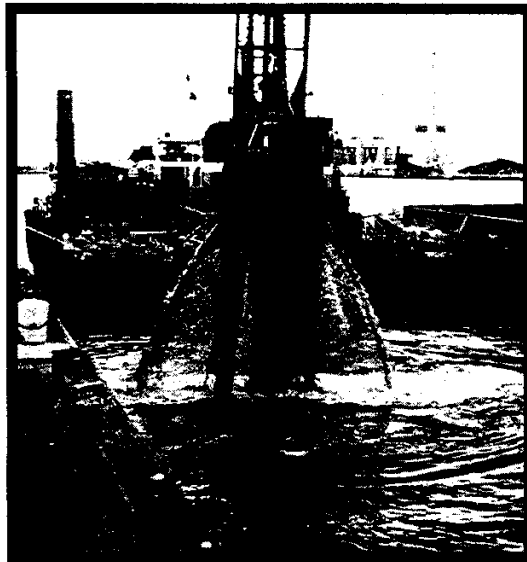
CZM Coastal Nonpoint Program
(617) 727-9530

EOEA Office of Technical Assistance for
Toxics Use Reduction (OTA)
(617) 727-3260

chapter V



**Managing Dredging
and Dredged
Materials Disposal**



ACTION PLAN #9

MANAGING DREDGING AND DREDGED MATERIALS DISPOSAL

Massachusetts has a strong maritime tradition. Wherever the shore provides adequate protection from the turbulence of the open ocean, one is likely to find boats. Harbors up and down the Massachusetts Bays coast -- from Plum Island Sound to Provincetown Harbor -- support commercial and recreational navigation. The smaller embayments may harbor fishing boats and pleasure craft, while larger ports frequently receive large tankers and barges. All of this navigation contributes to the economic well-being of the region and provides recreational opportunities for the region's residents.

Most harbors receive freshwater inflow from one or more tributaries, all of which carry loads of suspended sediment. Where a tributary reaches the still water of an embayment, it slows and drops this sediment load. Over time, the accumulated sediment can obstruct navigation channels. To prevent serious impediments to navigation, periodic dredging may be necessary to clear the sediment from these channels.

Although some dredging projects are designed to create new navigation channels, most dredging in Massachusetts is *maintenance* dredging, designed to merely retain the width and/or depth of an existing channel. Two dredging methods -- hydraulic and mechanical -- are commonly used to remove marine sediments. Hydraulic dredging uses a centrifugal pump to pick up a slurry of sediment and water, which is then transported through a pipeline directly to a nearby beach or to a barge which will carry it to some other nearshore disposal site. Hydraulic dredging is employed primarily when the dredged material is to be used for beach nourishment or dune creation. Mechanical dredging must be used when the sediments in question cannot be used for beach nourishment or dune creation. Large bucket scoops or shovels lift material from the ocean floor and place it in a barge or scow. The material is then usually transported to an offshore disposal site and deposited by opening doors on the bottom of the vessel, or is placed upland for dewatering and disposal.

Not surprisingly, removal of marine sediments can have adverse impacts on marine organisms, especially in areas where water circulation is limited and where bottom sediments are rich in organic matter. Most obviously, dredging removes the organisms which live in and on the sediments being dredged. Dependent marine species may be adversely impacted if such removal significantly reduces the diversity of species or disrupts food webs in the project area. Dredging also increases turbidity in and around the project area, and may trigger the release of toxics which have accumulated in the disturbed sediments. In sensitive marine environments, such as estuaries or salt marshes, these changes may exceed the tolerance levels of resident organisms. For instance, suspended sediment in the water column can block the sunlight necessary for photosynthesis in marine plants and algae, and can clog the gills and siphons of fish, molluscs, and other marine fauna. The effects may be limited to individual organisms or may encompass an entire local population or ecosystem.

Of course, once sediments are removed from the ocean floor, they must then be relocated somewhere else. Disposal of marine sediments often poses its own set of environmental problems. In some instances, dredged material can be used beneficially -- for instance, to cap a landfill or to nourish a beach. Dredged material that has no beneficial use due to contamination, for example, must be dumped at an ocean disposal site or shipped to a landfill. Because land-based disposal is typically many times more expensive than ocean disposal, and often presents greater environmental risks, ocean disposal is usually the preferred disposal option. The U.S. Environmental Protection Agency (EPA) recently designated an open water disposal site in the deep water of Massachusetts Bay (see *Massachusetts Bays Disposal Site* (MBDS) discussion in Chapter IV). The MBDS is currently designated for the disposal of only uncontaminated dredged material. There is also an undesignated disposal site in Cape Cod Bay.

The EPA and the U.S. Army Corps of Engineers (ACOE) share responsibility for all dredged materials management. The ACOE issues permits for individual disposal actions, which must conform with the Ocean Dumping Criteria set forth in 40 CFR Part 227. The EPA has authority to veto an ACOE permit, and is also responsible for site monitoring. Over the past several years, surveys at the Massachusetts Bay Disposal Site (MBDS) have been conducted to determine the composition, distribution, and movement of disposed sediments, food chain interactions in and around the site, and bioaccumulation of contaminants in selected benthic species. By 1997, EPA will develop a long-term management plan for all of its open water disposal sites, including the MBDS.

Unfortunately, not all marine sediments are appropriate for ocean disposal. The same tributaries which deliver sediments to a coastal embayment also deliver a wide array of industrial pollutants. Because urban harbors and ports act as catchbasins for these pollutants, their sediments are often highly contaminated. If these sediments are dredged and then reintroduced to a clean site, the contaminants may have a severe impact on marine biota.

The disposal of contaminated sediments therefore poses an especially thorny set of problems. In some cases, the contaminated sediments may be "capped" with clean sediments to prevent bioaccumulation. However, capping has not yet been conducted in water as deep as that found at the Massachusetts Bay Disposal Site. Until the capping technique has been effectively demonstrated in deep water, and the legality of

such an approach has been established, EPA has prohibited all contaminated sediments from that site.

It has been estimated that port dredging projects in the Massachusetts Bays region will generate at least 15 million cubic yards of dredged material in the next fifty years. Much of that material will be heavily contaminated. Long-range planning is necessary to ensure that affordable and environmentally sound disposal options are available. Under the supervision of the Massachusetts Executive Office of Environmental Affairs (EOEA), the Massachusetts Office of Coastal Zone Management (CZM), and the New England Division of the ACOE recently collaborated on a dredged materials management study. The study report, a draft of which is due in 1996, is a positive first step to balancing the economic benefits and environmental risks of dredging projects in Massachusetts Bays.

The future of port dredging in Massachusetts Bays will also be shaped by an ongoing federal initiative to coordinate and simplify the administration of the more than 60 laws and executive orders regulating port dredging. Currently, as many as six federal agencies participate with state and local authorities in the permitting of a port dredging project. In January 1994, the Department of Transportation's Maritime Administration (MARAD) convened an Interagency Working Group on the Dredging Process. A major goal of this Working Group will be to articulate a national policy on port dredging and simplify the existing regulatory framework.

ACOE ACTION #9.1:

The Army Corps of Engineers, in coordination with EPA and other appropriate federal and state agencies, should continue to monitor dredged material disposal sites in the Massachusetts Bays region and to initiate the planning necessary to begin a capping demonstration project at the Massachusetts Bay Disposal Site.

RATIONALE:

The environmental aspects for disposal of dredged material have been regulated since the passage of both the Clean Water Act and the Marine Protection, Research, and Sanctuary Act. Criteria for determining the suitability of dredged material for open water disposal have been established. Certain sites such as the Massachusetts Bay Disposal Site (MBDS) and the Cape Cod Disposal Site have been designated for dredged material disposal. In order to determine the impact of dredged material disposal on the aquatic environment, the New England Division of the U.S. Army Corps of Engineers (ACOE) instituted the Disposal Area Monitoring System (DAMOS) in 1977 to monitor physical, chemical, and biological changes from dredged material disposal. However, no established dredged material disposal sites exist for the disposal of dredged material determined to be unsuitable for unconfined open water disposal. Accordingly, research to determine if capping at the MBDS is feasible - technically, environmentally, legally, and financially - should be encouraged.

RESPONSIBLE AGENT(s):

The ACOE will be responsible for continued implementation of the DAMOS program and for initiating the coordination and planning necessary to begin a capping demonstration project at the MBDS. Coordination with appropriate federal and state agencies, as well as solicitation of input from environmental advocacy groups and others, will be undertaken.

IMPLEMENTATION STRATEGY:

The ACOE will begin coordination with appropriate agencies and groups to determine the criteria necessary to demonstrate capping at the MBDS. In addition, the DAMOS program will continue to monitor the MBDS to determine impacts from dredged material disposal.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

\$1,700,000 (includes monitoring for the next ten years and a capping demonstration at the MBDS).

POTENTIAL FUNDING SOURCE(s):

The ACOE's DAMOS program, as well as other appropriate federal agencies (e.g., EPA) and state agencies.

TARGET DATE:

Coordination can begin immediately.

FURTHER INFORMATION:

For further information and assistance, contact:

ACOE Planning Directorate
(617) 647-8231
ACOE Regulatory Division
(617) 647-8291

EOEA ACTION #9.2:

The Executive Office of Environmental Affairs should coordinate the development of a comprehensive *Dredging and Dredged Materials Disposal Plan* to improve and maintain access to the Commonwealth's ports, harbors, and channels, and to minimize adverse impacts to the marine environment.

RATIONALE:

The harbors and ports of Boston are New England's gateways to overseas markets, providing the opportunity to strengthen our economic ties to foreign countries. The Commonwealth's smaller waterways are valuable for commercial and recreational purposes as well. They are a focal point for cargo and tourist traffic and, thus, are generators of jobs and economic growth for the region. In order for these gateways to reach their full potential, they must be easily accessible to shippers. Unfortunately, many area ports and harbors are not deep enough to accommodate the large modern vessels that must traverse them.

For example, the U.S. Army Corps of Engineers (ACOE) and the Massachusetts Port Authority have determined that Boston Harbor is approximately five feet too shallow to accommodate today's cargo ships. Dredging the Harbor would prevent tidal delays, maintain the flow of ships and cargo, and substantially reduce transportation costs.

However, several challenges are associated with dredging and the disposal of dredged materials. For example, dredging can not only disrupt aquatic life, but may also allow contaminants to filter into and degrade surrounding waters. The impact of dredging activity, therefore, must be minimized.

Another challenge is finding suitable disposal sites for clean and contaminated materials, a task all the more complex for Boston Harbor because of the sheer volume of recoverable materials. In the Inner Harbor alone, a volume of 3.3 million cubic yards of material needs to be dredged and disposed of safely, 1.3 million cubic yards of which is contaminated.

Related dredging and dredged materials disposal problems exist elsewhere along the Massachusetts coast. Because these problems entail a variety of environmental and economic issues, Massachusetts is in the process of developing a comprehensive *Dredging and Dredged Materials Disposal Plan* for all state ports and harbors.

RESPONSIBLE AGENT(s):

The Office of Coastal Zone Management (CZM) is the lead agent for this action, and is coordinating the efforts of the Department of Environmental Management (DEM), the Department of Environmental Protection (DEP), and the Department of Fisheries, Wildlife and Environmental Law Enforcement (DFWELE).

IMPLEMENTATION STRATEGY:

The *Dredging and Dredged Materials Disposal Plan* will be developed and implemented as follows:

1. Volume Projections. Projections of the volume of dredged material that will be generated over the next 50 years are being prepared by the ACOE based on the need for dredging to maintain shipping channels. This effort is being conducted in conjunction with DEM and CZM under an ACOE study.
2. Site Identification and Permitting. EOEA will use the projections of future dredged material generation, as well as the projections for the Boston Harbor Dredging Project, to identify and permit disposal sites. The EOEA Dredging Work Group will evaluate upland, nearshore, and ocean sites as potential disposal areas.
3. Site Selection. EOEA will decide whether to site state-sanctioned disposal areas on a regional basis or to develop criteria for proponents' use in siting project-specific disposal areas on an ad hoc basis. If EOEA decides to site state-sanctioned disposal sites, EOEA will proceed with site selection through the Massachusetts Environmental Policy Act (MEPA) process. Federal roles in both site selection and permitting are established under both the Clean Water and Ocean Dumping Acts, and are carried out by the ACOE and the U.S. Environmental Protection Agency (EPA).

4. Project Prioritization. EOEa will develop a method for prioritizing dredging projects in order to more efficiently allocate state resources. The EOEa Dredging Work Group will investigate expanding the traditional economic cost/benefit analysis to include the value of natural resources affected by dredging projects.
5. Disposal Regulations. DEP is currently developing new regulations that will govern the disposal of dredged material. With the exception of the limited disposal now permitted in state waters under 314 CMR 9.00, dredged material disposal is being regulated by DEP on a case-by-case basis. The suitability of dredged materials for ocean disposal at the MBDS will continue to be evaluated in accordance with the USEPA *Green Book* under the regulatory auspices of the federal Ocean Dumping Act (40 CFR 220-228).
6. Project Guidelines. EOEa is currently developing guidelines to help project proponents understand what permits will be required and what programs are available for their dredging and disposal activities. The guidelines will provide the framework for future DEP regulations.
7. Financing Plan. EOEa will develop a plan to finance the siting and management of state-approved disposal areas, if the policy for state-approved disposal sites is pursued. Since such costs are substantial (\$250,000 for the recently designated Cape Cod Disposal Site, not including ongoing monitoring), creative financing mechanisms will need to be considered. One option may be a revolving fund based on user fees for individual disposal actions.

LEGISLATION REQUIRED:

New legislation is not required. The authority to promulgate new regulations governing dredging and dredged material disposal currently exists under MGL Chapter 21A, section 14. The DEP will use this authority to develop new regulations, as stipulated in the law's rule-making process.

ESTIMATED COST:

Undetermined as yet.

POTENTIAL FUNDING SOURCES:

The 1996 Seaport Bond contains language authorizing \$5 - \$10 million for the scientific and planning studies necessary to develop the comprehensive dredging plan. Other potential funding sources include state agency accounts and user fees.

TARGET DATE:

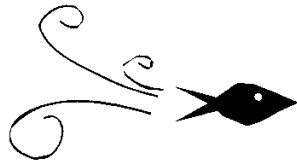
A draft *Dredging and Dredged Materials Disposal Plan* is due in 1996.

FURTHER INFORMATION:

For further information and assistance, contact:

Coastal Zone Management Office
(617) 727-9530, ext. 403

chapter V



**Reducing Beach
Debris and Marine
Floatables**



ACTION PLAN #10

REDUCING BEACH DEBRIS AND MARINE FLOATABLES

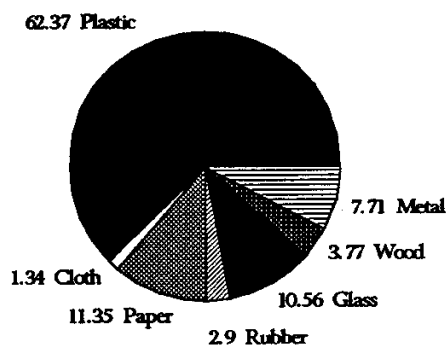
The beaches and nearshore waters of Massachusetts and Cape Cod Bays attract tens of thousands of bathers, hikers, boaters, and fishermen every year. This places these areas among the region's most important aesthetic, economic, and recreational resources.

Unfortunately, unsightly beach and marine debris detract from the full use and enjoyment of these resources. Like other coastal areas in the Commonwealth, the beaches and nearshore waters of the Massachusetts Bays region are fouled by a broad array of litter, including cigarette filters; glass and styrofoam pieces; plastic lids, straws, and wrappers; food bags; discarded fishing gear, tampon applicators; and metal beverage cans. The exact sources of this debris are often difficult to pinpoint. Some of it enters the marine environment from commercial and recreational fishing vessels. However, much of the debris appears to come from land-side sources. Local beachgoers, in particular, are a major source of beach debris. Other land-side sources include storm drains, sewage treatment plants, and combined sewer overflows. Once land-side debris reaches the coastal waters, the wind, tides, and currents of the Bays system generally keep it on or near shore.

Local economies which rely on coastal tourism suffer when beaches become cluttered with water-borne litter. Fishermen and other boaters lose thousands of dollars in fishing time and mechanical repairs when floatable debris wraps around propellers and propeller shafts. But debris is not only an eyesore and an inconvenience -- it also can pose a serious threat to marine organisms. Fish, birds, marine mammals, and turtles all can ingest or become entangled in floatable debris, often with dire consequences. Plastics, which consistently account for about two-thirds of all the debris collected on Massachusetts beaches, pose a particularly serious threat to marine organisms. An animal tangled in plastic debris can strangle, suffocate, or exhaust itself. Large pieces of ingested plastic can cause death by blocking the animal's digestive tract.

To ensure that Massachusetts beaches and nearshore waters become and remain clean enough for the humans and wildlife that depend on them, state and local officials must work in concert to reduce beach debris and marine floatables. The following action will provide a positive first step in that direction.

PERCENT COMPOSITION OF MASSACHUSETTS' BEACH DEBRIS



MASSACHUSETTS' 1993 DIRTY DOZEN

Debris Type	Total Number Reported	Percent of Total Debris Collected
1. Cigarette butts	61,259	31.66
2. Plastic pieces	10,366	5.36
3. Plastic food bags	10,206	5.28
4. Glass pieces	9,923	5.13
5. Foamed plastic pieces	9,367	4.84
6. Paper pieces	7,667	3.96
7. Plastic caps/lids	6,859	3.55
8. Plastic straws	6,819	3.52
9. Plastic rope	4,521	2.34
10. Lumber	3,479	1.80
11. Foamed plastic cups	3,292	1.70
12. Metal beverage cans	2,924	1.51
TOTAL	136,682	70.64

Source: COASTSWEEP 1993, Massachusetts Coastal Zone Management Office

MUNICIPAL ACTION #10.1:

Coastal municipalities should work cooperatively with the Massachusetts Coastal Zone Management Office (CZM), neighboring communities, and waterfront users to design and implement *Beach and Marine Debris Reduction Programs*.

RATIONALE:

Beach and marine debris poses a significant health threat to marine organisms, impairs recreational uses of the shore, and may hamper the economies of coastal communities which rely on tourism. Environmental, aesthetic, and economic concerns in Massachusetts Bays necessitate a comprehensive program which will identify sources of beach and marine debris and implement measures to reduce its impact on the marine environment.

Some successful beach and marine debris reduction programs have already been implemented in the United States and in Canada. In many West coast ports, for example, commercial dock operators have found that recycling can reduce the costs associated with disposal of marine refuse. In Halifax, Nova Scotia, the Maritime Fishermen's Union began a "Ship to Shore" trash campaign to educate commercial fishermen about the impacts of marine debris and to encourage them to bring their trash to port. Most recently, Portland, Maine launched a pilot program to serve as a model for future marine debris reduction projects in the Gulf of Maine.

The problem of beach and marine debris has not yet reached crisis proportions in the Massachusetts Bays region, in part because of existing clean-up efforts. At the end of each summer, for instance, the Massachusetts Coastal Zone Management Office (CZM) coordinates an annual *COAST-SWEEP* campaign during which thousands of volunteers turn out to remove debris from Massachusetts beaches. A few communities in the Bays region, such as Marblehead, have organized their own spring cleanups to supplement CZM's *COASTSWEEP*.

While these cleanup efforts help preserve the aesthetic integrity of Massachusetts' coastline, they are only a start. An effective debris reduction strategy must focus on preventing debris from reaching the shore as well as removing the debris which already exists. A few isolated debris reduction programs are now being established in the Massachusetts Bays region. Provincetown, for example, has worked cooperatively with CZM and others to develop a comprehensive local debris reduction program. (See *Strategies to Reduce Marine Debris - Provincetown, MA*, Provincetown Marine Debris Task Force, 1994.) Among other things, this

program is setting up a fishing net recycling program to encourage fisherman to return damaged gear to port rather than throwing it overboard.

Of course, marine debris circulates on ocean currents and tides, and debris which originates in one town may eventually end up on the shores of another. Because the problem transcends municipal boundaries, isolated debris reduction programs will not alone be effective. To ensure that beach and marine debris does not impair the traditional uses of the shoreline or endanger marine wildlife, all coastal communities throughout the Bays region should take steps to reduce beach and marine debris.

RESPONSIBLE AGENT(s):

Coastal communities will have to initiate their own beach and marine debris reduction programs. In most cases, the success of these programs will depend on an enthusiastic municipal coordinator, perhaps from the town's Community Development Office or Public Works Department. The municipal coordinator should work collaboratively with commercial and recreational users of the waterfront, neighboring communities, and CZM to devise and implement a comprehensive debris reduction program.

IMPLEMENTATION STRATEGY:

1. Form a local Beach and Marine Debris Task Force. The first and most obvious step is to convene the stakeholders who share an interest in reducing beach and marine debris. Interested parties may include:
 - Local officials (e.g., harbor masters, beach managers);
 - Wharf owners;
 - Fishermen/fishing trade association representatives;
 - Recreational boaters;
 - Environmental advocacy groups;
 - Cargo transport companies and other commercial users;
 - Waste management experts;
 - Chamber of Commerce representative; and
 - Officials from appropriate state and federal agencies (CZM, DEP, Massport, Coast Guard).

Formal letters of invitation should be sent to the appropriate people at least one month before the first scheduled meeting of the Task Force. It is essential that the Task Force include experts on marine vessel operations, waste management and disposal, and public outreach. If adequate funding is available, the city or town should consider hiring a project coordinator to oversee the project.

2. Assess the existing situation. Before it can devise an effective debris reduction program, the Task Force must first determine the volume and sources of beach and marine debris, and evaluate existing disposal programs. Initial assessment surveys will help provide the foundation for an effective marine debris reduction strategy, and will also establish a baseline by which to evaluate the program's effectiveness.
3. Design a debris prevention/collection/disposal strategy. Once waste disposal problems have been identified and prioritized, the Task Force should evaluate options to address those problems. Specific strategies might include placing trash bins on wharves; providing separate collection bins to facilitate recycling; establishing a port-wide disposal site; providing used oil recycling containers; organizing volunteer clean-up efforts; and/or reducing the use of disposable products and plastics along the waterfront.
4. Promote public awareness. The success of a beach debris reduction program will depend to a large degree on the public's acceptance of the program's objectives and methods. Therefore it is essential to educate the public about the impact of beach debris, proper recycling and disposal methods, and how to reduce the use of disposable products which typically become marine debris. Depending on the available funding, the Task Force may decide to distribute brochures or flyers, organize workshops for targeted user groups, or contact local media.
5. Implementation and on-going evaluation. Using the initial assessment survey as a baseline, the Task Force or project coordinator should track the aesthetic, economic and other material benefits of the project. Careful evaluation will suggest how the program might be refined and, by establishing evidence of the program's effectiveness, may generate additional support and funding.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

The cost of a beach and marine debris reduction program will vary according to the extent of the debris problem and the nature of the actions which are required to address it. The initial assessment and design of the program should generally be accomplished at relatively low cost to the city or town. Implementation costs may be more substantial, although a coastal community should be able to support these costs. Considerable savings may be realized by recruiting volunteers or, if the local Task Force decides to hire a project coordinator, by procuring the services of a graduate student seeking experience in environmental policy or waste management.

POTENTIAL FUNDING SOURCES:

Start-up funds for a beach and marine debris reduction program must generally originate as appropriations from a municipal budget. In order to be successfully implemented, the program must become self-supporting after a short time. Implementation funds could possibly be raised through creative partnerships with waterfront users and charitable foundations. For instance, stakeholder corporations, including waste management specialists, might be persuaded to contribute free services to the project. Similarly, community groups may "adopt" specific waterfront sites and assume responsibility for stewardship of these sites.

TARGET DATE:

1997. It should take approximately six to nine months to assemble a local Task Force and design a beach and marine debris reduction program that is tailored to a community's specific needs. Implementation of such a program would be ongoing, but could possibly begin as early as 1998.

FURTHER INFORMATION:

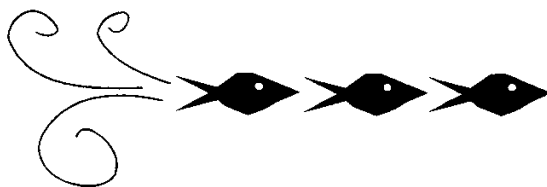
For further information and assistance, contact:

Massachusetts Coastal Zone Management Office
(617) 727-9530
Center for Marine Conservation
(202) 429-5609
Your area's Regional Planning Agency

chapter V



**Protecting
Nitrogen-Sensitive
Embayments**



ACTION PLAN #11

MANAGING NITROGEN-SENSITIVE EMBAYMENTS

Nitrogen is important plant nutrient in coastal waters, necessary for the proper growth and reproduction of individual organisms and for the general productivity of the Bays ecosystem. Excessive nitrogen, however, may stimulate an undesirable explosion of algal growth or "bloom" that might otherwise not occur. (Note: some "blooms" are naturally-occurring; for example, we observe a "spring bloom" and a "summer bloom" in Massachusetts Bay every year.) Major algal blooms can dramatically alter the conditions in a coastal embayment and thereby disrupt its natural ecology. They may, for instance, limit the penetration of sunlight and disrupt the photosynthetic processes of other marine flora. Or, as they decompose, they may deplete dissolved oxygen in the water column, killing fish and other fauna. These cumulative adverse impacts caused by an increase in nitrogen are often referred to as coastal "eutrophication" or "nutrient enrichment."

Nitrogen is conveyed to Massachusetts Bays coastal waters by various pathways, including ocean water inflow, sewage outfalls, groundwater flow, atmospheric deposition, and stormwater runoff. A study sponsored by the Massachusetts Bays Program indicated that point source discharges account for somewhere between 43 and 66 percent of the total nitrogen entering the Bays (*Sources and Loadings of Pollutants to the Massachusetts Bays*, Menzie-Cura and Associates, 1991). Ocean water inflow, river discharges,

atmospheric deposition, and runoff also contribute significant nitrogen loadings. In unsewered areas, including large parts of the Upper North Shore, the South Shore, and Cape Cod, groundwater contaminated by poorly maintained septic systems may be the most significant source of nitrogen to nearshore waters.

The relative impact of various nitrogen sources in any embayment depends largely on land use patterns in the surrounding drainage basin. Volume, flushing time, bathymetry, and water quality all determine the nitrogen loadings a particular embayment can absorb without becoming eutrophic. In general, the effects of nitrogen loading are localized around the point of nitrogen discharge. Most of the serious effects of nitrogen loading occur in shallow, nearshore embayments.

In order to ensure the health of nearshore waters and the living resources they support, specific actions need to be taken to identify nitrogen-sensitive embayments and limit nitrogen loadings. An effective management strategy will combine restrictions on the types and patterns of development and the use of denitrification technologies.

The following recommended actions are a positive step toward reducing or preventing nitrogen pollution in the Bays' coastal waters and groundwater.

DEP ACTION #11.1:

The Department of Environmental Protection should strengthen *Massachusetts Water Quality Standards* to enhance and protect nitrogen-sensitive coastal embayments.

RATIONALE:

Excessive fertilization (high nitrogen loading) can impair the quality of coastal waters and the living resources they support. Shallow, poorly flushed embayments with proportionately large watersheds are especially at risk. When overloaded with nitrogen, these waters can suffer depressed oxygen levels, nuisance growth of algae and other aquatic vegetation, and the decline or loss of eelgrass beds.

Contributing to the problem of nitrogen-enrichment are a variety of point and nonpoint pollution sources, including wastewater treatment plants, septic systems, urban and agricultural runoff, and even atmospheric deposition. While no single source may itself be problematic, the cumulative nitrogen loadings from many sources can exceed an embayment's critical loading limit. The current *Massachusetts Water Quality Standards* are not adequate to protect nitrogen-sensitive coastal waters from excessive nitrogen inputs. Therefore, the DEP should amend the *Massachusetts Water Quality Standards* to include embayment-specific nitrogen-loading limits that will protect these sensitive embayments from the cumulative impacts of both point and nonpoint sources of pollution. Any proposed changes to the *Massachusetts Water Quality Standards* must be reviewed and approved by the U.S. Environmental Protection Agency (EPA).

RESPONSIBLE AGENT(s):

DEP's Division of Water Pollution Control will have primary responsibility for this action. Formal designation of nitrogen-sensitive embayments and nitrogen loading limits will be proposed by DEP with information and guidance provided by the Regional Planning Agencies, municipalities, and the yet-to-be-formed interagency work-ing group (made up of state and federal agency representatives and marine scientists). While DEP will designate the embayments at risk, much of the responsibility for implementing measures to protect these waters will ultimately fall on the particular embayment (and surrounding watershed) communities. Accordingly, an outreach effort designed to educate and gain the support of local officials will be an important part of this action.

IMPLEMENTATION STRATEGY:

DEP will begin to designate nitrogen-sensitive embayments in the 1998 revisions to the *Massachusetts Water Quality Standards*. Because of the significant management and cost implications associated with such designations, it is imperative that the designations have as sound a scientific basis as possible. To accomplish this, DEP will work closely with the Regional Planning Agencies, municipalities, and the inter-agency working group (see RPA/DEP/Municipal Action #11.2). Based on information provided by these groups, DEP will identify those embayments predicted to be at risk for designation as nitrogen-sensitive and will set critical loading limits.

LEGISLATION REQUIRED:

This action requires amending the *Massachusetts Water Quality Standards* to include critical loading limits for nitrogen-sensitive embayments.

ESTIMATED COST:

This action can be implemented by existing DEP staff.

POTENTIAL FUNDING SOURCE(s):

DEP's annual operating budget (for staff time).

TARGET DATE:

Initial proposal(s) for designating nitrogen-sensitive embayments - 1998 revisions to *Massachusetts Water Quality Standards*.

FURTHER INFORMATION:

For further information and assistance, contact:

DEP Division of Water Pollution Control
(617) 292-5673

RPA/DEP/MUNICIPAL ACTION #11.2:

The Regional Planning Agencies, in collaboration with the Department of Environmental Protection and municipalities, should expand upon current Massachusetts Bays Program efforts to identify nitrogen-sensitive embayments, determine critical loading rates, and recommend actions to manage nitrogen so as to prevent or reduce excessive nitrogen loading to coastal waters and groundwater.

RATIONALE:

Coastal eutrophication is an ecological response to the accumulation of high nutrient concentrations in an embayment or nearshore area. Environmental effects of eutrophication include degradation of water and sediment quality, loss of submerged aquatic vegetation, shellfish habitat and, in extreme cases, fish kills. Elevated nutrient levels (especially nitrogen) in marine waters can lead to excessive algal growth, which in turn can lead to depletion of dissolved oxygen, adversely affecting the organisms that live and grow in an embayment. Anoxia (i.e., the absence of oxygen) is the most extreme endpoint of nutrient enrichment, but there are other concerns as well. Increased algal growth also can cause a reduction in water clarity, which in turn can affect the distribution and abundance of aquatic organisms and cause changes in species composition. Die-off of algal blooms can result in increased organic matter deposition to bottom sediments, depleting sediment oxygen concentrations and adversely affecting benthic organisms and submerged plants.

The processes controlling coastal eutrophication are complex, and the specific factors contributing to the eutrophication potential can be variable among sites. The eutrophic status of coastal embayments depends on many factors, primarily nitrogen loading, flushing rates, and the biological productivity of an embayment. The sensitivity of an embayment to nitrogen loading depends on a combination of biological, physical, and chemical processes, both on land and in the water column. This complexity makes it difficult to accurately predict the level of nitrogen loading that will cause a specific embayment to become eutrophic. Nonetheless, it is important to develop a methodology to determine the potential for embayments to become eutrophic because of the detrimental impacts that can occur. For these reasons, the Department of Environmental Protection's recently promulgated Title 5 revisions address the importance of protecting nitrogen-sensitive waters (including groundwater), and the Massachusetts Bays Program has developed a measurable goal to identify embayments at risk of eutrophication.

Several efforts are underway to develop nitrogen management plans for those embayments in Massachusetts and Cape Cod which may have a high potential for becoming eutrophic.

Nitrogen loading is seen as the critical parameter to control since it is the primary variable affecting algal biomass and productivity, and because a significant amount of the loading is from anthropogenic sources (e.g., lawn fertilizers and septic systems). Reduced loadings of nitrogen can be achieved through proper land management and wastewater management practices.

In March 1995, the Massachusetts Bays Program convened a working group to review work that has been undertaken in other parts of the state and to help take the first steps in applying this information to the embayments in the Massachusetts and Cape Cod Bays region. The participants in the working group include scientists from the University of Massachusetts, representatives of the Massachusetts Bays Program and Buzzards Bay Project, Massachusetts Coastal Zone Management Office, and the Massachusetts Department of Environmental Protection. Based on the recommendations of this group, the Massachusetts Bays Program has funded a first-tier analysis project. This project will catalogue existing flushing information (or estimate flushing rates where data are not available), delineate zones of contribution for nitrogen to selected embayments along the coast, determine nitrogen sources, estimate loading based on land-use categories, and calculate oceanic nitrogen loading to the embayments. The results of this project, due in March 1996, will be a first approximation of the coastal embayments in Massachusetts and Cape Cod Bays that are likely to be at risk of eutrophication.

To date, most of the efforts to define nitrogen loading to Massachusetts' embayments have occurred on Buzzards Bay and Cape Cod. These areas, compared with areas north of the Cape, are thought to be more susceptible to eutrophication due to the predominance of well-drained glacial soils, heavy reliance on individual on-site sewage disposal systems, and lower tidal range and flushing rates.

The Buzzards Bay Project has been at the forefront in developing a methodology and criteria to identify nitrogen management areas in the Buzzards Bay region (BBP, 1994). The Cape Cod Commission has been applying a similar methodology while assisting with the collection of information with region-wide implications under the Waquoit Bay

National Estuarine Research Reserve Land Margin Ecosystem Research Project (WBNERR-LMER). Nitrogen loading assessments have been completed for a number of watersheds, but correlation of observed effects with nitrogen loading rates has been somewhat limited. In general, the methodology begins with the delineation of an embayment watershed. This is followed by a nitrogen loading assessment of existing and potential future land uses within the watershed. The loading rates determined in this way are then compared with a critical loading rate that has been determined for the embayment as a result of a flushing study. Eutrophication indices have been developed for the Buzzards Bay and Cape Cod embayments. These indices are used to help set priorities for allocating resources to address nitrogen management issues.

Through efforts at WBNERR, a computer model has been developed incorporating the three methodologies used on the Cape to determine nitrogen loading and nitrogen management areas. These models have been developed specifically for permeable glacial soils and do not consider overland flow from areas underlain by bedrock or from large urban areas. While modifications may need to be made if these models are to be applied to other areas in Massachusetts, they provide an excellent starting point for other regions in Massachusetts that need to begin developing priorities for nitrogen management.

RESPONSIBLE AGENT(s):

The Regional Planning Agencies' technical staff, in cooperation with the DEP and local departments and boards (Planning Boards, Conservation Commissions, Boards of Health) would share responsibility for this action. Technical and financial support could be provided by the DEP through its watershed management and nonpoint source programs. Additional technical support, including training of RPA and municipal personnel, could be provided by the Buzzards Bay Project, the Cape Cod Commission, and WBNERR. Implementation of nitrogen control measures would be largely a local responsibility, to be achieved through actions by Town Meeting/City Council vote and promulgation of land use and health regulations by the local Planning Boards, Conservation Commissions, and Boards of Health.

IMPLEMENTATION STRATEGY:

Using the general approach developed by the Cape Cod Commission, Buzzards Bay Project, and Waquoit Bay National Estuarine Research Reserve, the Regional Planning Agencies, DEP, and municipalities should collaborate on the following implementation strategy:

1. Review results of the Massachusetts Bay Program-funded project to rank embayments at risk of eutrophication; target embayments identified as potentially sensitive to nutrients.
2. Determine flushing rate of each estuary/embayment and subembayment. Where flushing rate has not been defined, collect necessary data and determine the flushing rate for each potentially sensitive estuary/embayment and subembayment.
3. Define subwatersheds to the more poorly flushed portions of the selected estuaries/embayments, as necessary.
4. Work with the MBP working group to identify appropriate indicators of eutrophication, such as dissolved oxygen levels, extent of algae and other aquatic plants, concentrations of chlorophyll-a in the water column, and depth of light penetration; develop a process to determine critical nitrogen loading rates.
5. Estimate and compare critical loading rates to cumulative nitrogen loads from both existing and projected ("build-out") development scenarios, based on current zoning.
6. Identify and implement appropriate management strategies, including both preventive and remedial actions as necessary, for each estuary/embayment (or portions thereof) deemed to be at risk of eutrophication.

Public education and participation will be essential throughout this process, and the RPAs and the municipalities should establish working committees around each estuary/embayment. As needed, these committees should invite the participation of representatives from other municipalities who have already begun to implement specific nitrogen-management actions - for example, the Buzzards Bay towns of Bourne, Carver, and Plymouth, which have rezoned the recharge area of Buttermilk Bay to limit nitrogen loading to that estuary.

LEGISLATION REQUIRED:

No legislation is required at this time; however, ultimately, stricter local zoning and land use regulations may be required in the recharge areas of waters determined to be nitrogen-sensitive.

ESTIMATED COST:

Based on Cape Cod Commission estimates, total costs per estuary/embayment could range between \$90,000 - \$200,000. If current (1990) MacConnell land use data are not available for an embayment area, the costs of obtaining these data could range from \$10,000 - \$20,000.

POTENTIAL FUNDING SOURCE(s):

Potential funding sources include DEP 319 (nonpoint source) grant funds and local property tax revenues.

TARGET DATE:

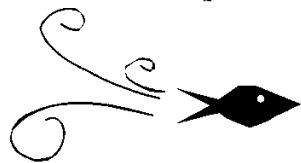
MBP, in conjunction with DEP and CZM, will begin identifying and prioritizing nitrogen-sensitive embayments in 1996/1997. The development and implementation of appropriate local and areawide nitrogen management measures should begin in 1997/1998.

FURTHER INFORMATION:

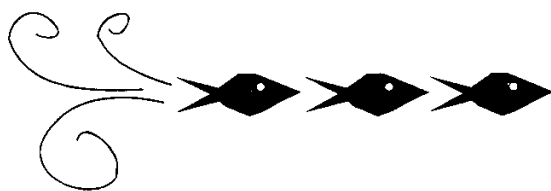
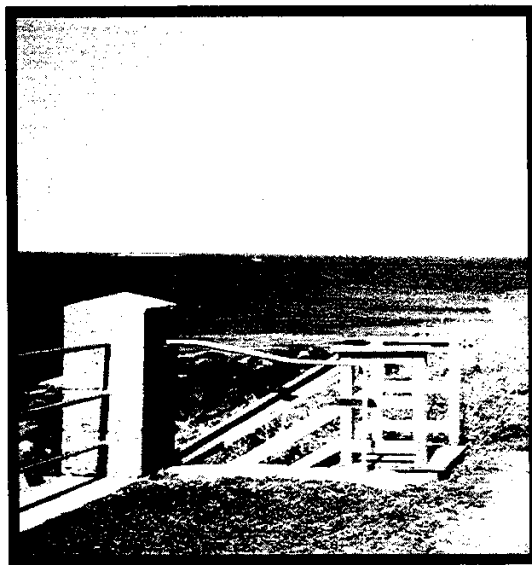
For further information and assistance, contact:

Massachusetts Bays Program
(617) 727-9530
Buzzards Bay Project
(508) 748-3600
Cape Cod Commission
(508) 362-3828
WBNERR-LMER
(508) 457-0495

chapter V



**Enhancing Public
Access and the
Working
Waterfront**



ACTION PLAN #12

ENHANCING PUBLIC ACCESS AND THE WORKING WATERFRONT

The Massachusetts Bays Program is concerned with the effect humans have on the sea, but it is also concerned with the effect that the sea has on humans. Few would argue that the sea has a mysterious power to invigorate our souls and refresh our spirits. Massachusetts Bays has a particularly diverse and beautiful shoreline, encompassing rocky headlands, sandy beaches, and just about every coastal landform in between. The shoreline is among the region's most important economic and recreational resources. It is hardly surprising, then, that people want to visit the coast for recreation and relaxation -- or that oceanfront property is among the region's most valuable real estate.

Nobody owns the ocean, of course; but individuals *do* own shorefront property and can use the rights of ownership to restrict public access to the shoreline. The tension between private property rights and public access to the waterfront is as old as the Commonwealth itself. Although the settlers who founded the Massachusetts Bay Colony brought with them from England a strong tradition of private property rights, their legal tradition tempered those property rights by recognizing that some resources -- such as air and water -- were held in common by all people. The idea that certain resources are owned in common, often called the Public Trust Doctrine, actually dates back to Roman law. The emperor Justinian codified the doctrine in 529 A.D. by declaring: *"By natural law itself these things are the common property of all: air, running water, the sea, and with it the shores of the sea."* In 1641, when the Massachusetts Bay colonists adopted a Colonial Ordinance to guarantee public access to the colony's Great Ponds, they codified the Public Trust Doctrine for the first time in America. Subsequent amendments to the Colonial Ordinance extended private land ownership to the low tide line, but expressly reserved the public rights of "fishing, fowling, and navigation" in the intertidal zone. At the time, these three activities represented the only significant public uses of the foreshore.

The Commonwealth of Massachusetts still reserves a public easement for purposes of "fishing, fowling, and navigation" between the high and low water marks. But today, of course,

the public engages in a much wider array of recreational activities. Some shorefront recreation, such as swimming, jogging, and kite-flying, are active. Other recreational uses, such as beachcombing, birdwatching, sunbathing, or simply gazing at the distant horizon, are more passive. Whatever activity attracts people to the shore, it is clear that the lure of the sea is strong, and that people in ever greater numbers are turning to the sea's edge for a respite from our fast-paced, complex society. The Massachusetts Bays watershed averages more than 5400 people per square mile. More than three quarters of the state's population lives within an hour's drive of the coast. Crowding and conflicting uses of the shorefront have heightened the age-old tension between public access and private ownership.

Although the Commonwealth has more than 1,500 miles of shoreline, only 363 miles are owned by and accessible to the public. The remaining shoreline is privately owned and unavailable for public use except for the narrow purposes of "fishing, fowling, and navigation" within the intertidal zone - and even these purposes are often difficult to pursue. For example, recreational fishing access and opportunities have declined markedly in recent years, especially in the Metropolitan Boston area. Increasing population on the coast along with associated changes in waterfront development and use have severely limited the options of the average angler. The Massachusetts Public Access Board has attempted to address this problem in recent years by constructing and repairing boat ramps in the Bays region. While these efforts are to be applauded, far greater support is needed. Little progress has been made, for example, in establishing shorefront access sites for anglers desiring to fish from shore. Recreational fishing piers and other public waterfront sites are needed to enhance these opportunities.

Beach access is also a problem. On any hot summer weekend, the demand for sandy public beaches within two hours of Boston is likely to exceed the supply. Those with transportation may travel to more remote beaches on the North and South Shores, or on Cape Cod. But many beach parking lots fill up before 10:00 a.m., effectively excluding those who

live beyond a certain distance or whose leisure time comes later in the day. Access is further restricted by communities which establish quotas on the number of out-of-town cars or which set exorbitant parking fees for non-residents.

While recreational pressures mount, development in coastal communities has further impeded public access to the shore. Waterfront development in coastal towns continues to inhibit both physical and visual access to the sea. Many coastal communities have lost historic rights of way. In some cases, the communities have failed to maintain accurate, up-to-date inventories of the public accessways that were incorporated into private land deeds, and over the years these access points have been lost through transfers of ownership. In other instances, abutting property owners have intentionally extended their lawns or driveways over a public way, deterring public use of the accessway by making it indistinguishable from their own property.

While some communities have responded positively to encroachment on recorded town ways by posting signs or constructing boardwalks, other communities simply maintain a list of local accessways at the town hall. Residents of coastal communities often prefer this approach, since posting signs may attract unwelcome visitors and add to existing problems of cramped parking, vandalism, and litter.

Because coastal communities do not always seem able or willing to enhance public access to the shore, the Commonwealth recently launched its own initiative to establish the right of public passage along the intertidal zone. Many states have already established this right. California, for example, amended its constitution to make its beaches public in 1873. Texas opened its coast to the public in 1959, and Oregon followed suit as a result of a State Supreme Court ruling in 1969. Most recently, the New Jersey Supreme Court recognized public recreational rights on the foreshore, and even on the dry sand above the high tide line. The goal of the Massachusetts initiative is to establish the right of public passage along the high tide line. Since the right of passage would "take" one stick from the landowner's traditional bundle of property rights, the state may be required to compensate landowners under the "just compensation" clause of the Fifth Amendment.

The Commonwealth's Department of Environmental Management has recently launched a Coastal Access Program whose goal is to promote the general public's access to the coast. The program's two main components are the Sea Path Program and the Coastal Access Small Grants Program. Based on the statutory mandate of legislation adopted in 1991, the Sea Path Program's goal is to acquire legal rights-of-way along the intertidal zone for the public to walk, hike, and stroll during daylight hours. In almost all other coastal states, the intertidal zone is held in the public trust and is the moral and legal foundation for many of the public's coastal access rights. Though a number of shoreline landowners

allow the public to use the intertidal zone for a variety of recreational purposes, many assert their private property rights by actively excluding such public use. Sea Path rights-of-way can either guarantee for the future the public's right to walk in areas where informal access is currently allowed, or they can potentially open up new areas to walkers. The Program is designed to work with local partners (e.g., citizens, public officials, nonprofits, and shoreline landowners) to identify potential sites, negotiate with landowners, develop management strategies, and acquire rights-of-way. The Sea Path Program is complemented by the Coastal Access Small Grants Program, which has been established to support and inspire "coastal access" projects conducted by municipalities, nonprofits, and regional entities. The program's goals are defined more broadly than the Sea Path Program, and generally fall into the four categories of: 1) planning and establishing new coastal pathways or access points; 2) reclaiming historic rights-of-way; 3) enhancing existing coastal access facilities; and 4) conducting associated educational/outreach initiatives. The program helps tie together fragmented but complementary efforts into a unified, coastwide movement towards increased and enhanced public access to the coast.

Another major access initiative spurred by the recent water quality improvements to Boston Harbor is the proposed Boston Harbor Islands National Recreation Area. The Boston Harbor Islands represent the last frontier of recreational open space in coastal Massachusetts. No other place in the United States has so many islands - offering so much untapped opportunity - so close to a major city. This could soon change with the passage of federal legislation that would create a Boston Harbor Islands National Recreation Area. The legislation calls for the 50 square miles of Boston Harbor, currently a 31-island state park, to be managed by the National Park Service under cooperative agreements with state, local, and private owners. The recreation area plan would allow some islands to remain pristine and others to be developed recreationally. Plans include improved public access to the islands, using new or restored piers, visitor orientation and environmental education centers, educational programs, and year-round rangers to manage the islands and facilitate their enjoyment by the public.

Of course, recreationists are not the only people concerned about access to the coast. Access to the waterfront is also essential to marine-dependent commercial and industrial users. Commercial fishing, cargo shipping, boat yards, and ferry services all contribute to the "working waterfront" -- a legacy of the Bay State's longstanding maritime tradition and a major component of the region's economy. Ports have special industrial needs at the waterfront, including piers and berths, off-loading and warehouse space, fuel storage facilities, dredged shipping channels, and deep-water turning basins. However, marine-dependent industries are facing increasing competition for limited waterfront space. Although recreational uses account for some of this competi-

tion, the more serious threat comes from non-marine-dependent uses of the waterfront such as residential development, hotels and restaurants, office buildings, and shops. Encroachment of non-marine-dependent uses into Designated Port Areas (DPAs) can impair a port's primary maritime functions. These kinds of conflicts are occurring in Designated Port Areas all along the Massachusetts Bays coast.

Resolving these conflicts will not be easy. Nevertheless, some guidelines have emerged from the State Legislature's changes to Chapter 91, the Public Waterfront Act. Updated waterways regulations promulgated in 1990 contain numerous initiatives to enhance the state's stewardship of coastal waterways by:

- *Ensuring that the immediate waterfront is used primarily for water-dependent uses;*
- *Supporting public/private partnerships to revitalize the waterfront;*
- *Providing public access for use and enjoyment of the waterfront;*

- *Strengthening state programs for shoreline conservation and utilization;*
- *Strengthening local controls and encouraging harbor planning; and*
- *Ensuring accountability to public interests.*

These initiatives demonstrate the state's commitment to putting its waterfront to the highest and best use. But, of course, not all coastal areas can -- or should -- accommodate human uses. Encroachment on sensitive coastal habitats, such as eelgrass beds and sand dunes, must be carefully managed to avoid adverse effects on commercially and ecologically important fish and wildlife populations.

As more and more people compete for the limited Massachusetts shorefront, human uses will need to be simultaneously enhanced and managed to protect the coastal environment. Only rational planning and a keen awareness of the long-term public interest will ensure that our coastal heritage is preserved for the generations to come. The following recommended actions are a starting point for achieving this.

MUNICIPAL ACTION #12.1:

Municipalities should develop and implement *Municipal Harbor Plans* which: 1) promote marine-dependent waterfront uses, 2) enhance public access to the water, and 3) protect habitat of shellfish and other living resources.

RATIONALE:

Shoreline property is among the most economically valuable real estate in the Massachusetts Bays region. Economic pressures have brought dramatic changes in the use of the shoreline. Intensive residential development has limited access to beaches and shellfishing areas. Water-dependent uses such as boatyards and marinas which generally provide facilities for the fishing industry are being displaced by non-water-dependent uses such as restaurants, condominiums, and offices. As the traditional working waterfronts are replaced by such uses, the historic maritime character of these areas is lost, along with important economic and recreational opportunities.

With nearly 50 percent of the citizens of Massachusetts living within five miles of the coast, pressures along or near the shoreline consume much of the time and attention of municipal boards and planners. Indeed, the task of reviewing and permitting development proposals alone can be almost overwhelming, and affords little opportunity for sound, proactive coastal planning. By completing a *Municipal Harbor Plan*, a community establishes a mechanism for addressing major land-side and water-side issues - many of which may be in conflict - in a thoughtful and coherent manner.

RESPONSIBLE AGENT(s):

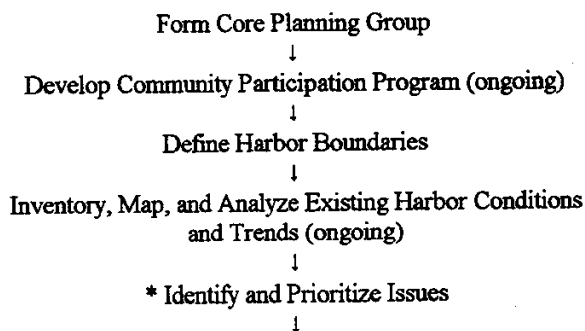
Harbor commissions, harbor committees, or other core working groups will be responsible for this action. Such groups should represent the diverse interests of the waterfront, and include local officials (selectmen, planners, harbormasters, etc.), agencies with jurisdictional interests in the waterfront (port authority, redevelopment authority, etc.), waterfront businesses and land owners, and recreational users. Planning and advisory assistance, along with inventory data and maps, are available from CZM and the Regional Planning Agencies.

Key issues to be addressed include: 1) designation of "working waterfront" overlay zones to ensure the preservation of boatyards and other traditional maritime uses; 2) development of a public access strategy, including accompanying guidelines that will indicate how any future Chapter 91

licensing projects should contribute to the implementation of the strategy when meeting their associated access benefits requirements; 3) establishment of watershed zoning to protect sensitive coastal resources and minimize use conflicts on the water; 4) designation of federal No Discharge Areas (NDAs) to minimize boat waste impacts on shellfish harvesting areas; 5) adoption of strict design and construction standards to minimize impacts to public safety and the economy resulting from coastal storms; and 6) identification of the plan's recommended implementation measures that the community proposes for substitution or amplification of the state waterways regulations.

IMPLEMENTATION STRATEGY:

The harbor planning process should be an open, interactive process that invites the participation and input of diverse sectors of the community. CZM has developed harbor planning regulations (301 CMR 23.00) and guidelines (*Harbor Planning Guidelines*, May 1988) to help communities through this process and the process of gaining state approval for their *Municipal Harbor Plans*. Consistency of the local plans with the Harbor Planning Guidelines, CZM policies, and the state's tidelands policies, objectives, and associated waterways regulations are the principal standards for state approval of the plans. Development of a Request for a Scope explaining how the Harbor Planning Guidelines will be applied is the first critical step of the planning process. Upon CZM's issuance of a Scope, communities may begin the plan development process. While particular waterfront issues identified in the Scope may vary from one harbor to another, communities should adhere to the same planning process as follows:



CZM ACTION #12.3:

The Coastal Zone Management Office should establish a new technical assistance program to accelerate municipal efforts to identify and legally reclaim historic rights-of-way to the sea.

RATIONALE:

In days of yore when the Massachusetts population relied heavily upon the sea for food and transportation, and when a network of pathways leading to and along the shore was an essential part of the coastal life-support system, most shorefront communities took steps to establish public rights-of-way to the sea. These public ways were written into the deeds of private property owners, often when the land was first platted, in order to secure for all citizens the perpetual benefit of access to the water's edge. Many of these historic town ways subsequently disappeared from private land deeds as transfers of ownership took place in the absence of municipal vigilance and accurate record-keeping, even in cases where public use continued without interruption. Other accessways are still "on the books" but are hidden and unknown, even to local residents, as a result of deliberate concealment by abutting property owners who have become expert in the dubious art of access concealment.

The importance of locating and legally reclaiming town ways is not always apparent in cases where activity patterns have shifted to other locations or uses. For example, the demand for an accessway for fishing purposes may have declined temporarily due to deterioration in a locale's water quality. However, town ways are seldom truly obsolete. For example, certain nearshore waters where shellfishing is currently prohibited have seen a dramatic rise in windsurfing, ocean kayaking, and use of other light watercraft -- all requiring access to safer, more sheltered launching sites than are provided at public motorboat ramps. Similarly, with waterfront strolling an ever-popular pastime, historic footpaths could be joined with newly-acquired public rights-of-way to form coastal trail networks for pedestrian use and enjoyment in previously unapproachable areas. Finally, unlike other approaches to obtaining shoreline access for the public, the process of reclaiming and preserving historic rights-of-way is generally straightforward and relatively inexpensive (except, of course, where litigation is required to settle a contested case).

This is not to say that it is a trivial matter to reestablish and protect public rights-of-way. One threshold impediment is attitudinal in nature, insofar as some communities have a longstanding political tradition of avoiding confrontation with influential owners of waterfront property, a tradition

commonly supported by nearby residents who already know where the neighborhood ways to the sea are and prefer to keep the information to themselves. And even with the moral support of community leaders and citizens-at-large, an effective rights reclamation program cannot be developed without at least some assistance from legal professionals on a fee-for-service basis. Moreover, a cadre of volunteers must be available to carry out the painstaking research that is often needed to support negotiations with affected property owners as well as litigation that may be necessary to resolve continuing disputes.

Reclaiming historic rights-of-way is a considerable challenge, and to date municipalities have been left almost completely on their own to tackle it. Indeed, only a handful of communities have succeeded to any significant degree (e.g., Rockport and Gloucester). Therefore, it is essential that the state begin taking a more active role in facilitating local access reclamation efforts, by developing the capability to provide substantial and ongoing technical assistance.

RESPONSIBLE AGENT(s):

In keeping with its history of encouraging and supporting public access initiatives at all levels of government, CZM should assume lead responsibility for this action.

IMPLEMENTATION STRATEGY:

This action should be implemented in two phases, beginning with the mobilization of a variety of support resources for municipal use. Key elements to be pursued in this first phase would include: preparation of case histories and an educational video to tell the story of the success achieved in Rockport and Gloucester; preparation of a practitioner's handbook with "how to" guidance on carrying out the legal and other tasks commonly required to reclaim historic rights; development of a lawyer network/referral service to assist municipalities in obtaining professional assistance on a pro bono basis; and completion of a series of "incubator" workshops in all regions of the coast to promote campaigns for rights-of-way reclamation and to provide initial training for campaign participants.

In the second phase, CZM should develop a permanent outreach capability by creating a staff position for a "special counsel for public access." This attorney would provide ongoing technical assistance to municipal access programs as well as facilitation services to help resolve user-owner disputes, in cases where litigation might be avoided through objective third-party intervention. Complaints that could be referred to the special counsel include those of members of the public who feel they have been inappropriately excluded from public accessways, together with those of aggrieved property owners who seek to ensure that public access occurs in a manner that recognizes the legitimacy of their own interests as well. Finally, it should be the responsibility of the access attorney to develop and maintain a "Register of Protected Coastal Rights-of-Way" for purposes of keeping track of all shoreline access entitlements that have been secured for the public as a result of municipal reclamation programs, as well as by various programs of regulation and acquisition being carried out by other agencies within the CZM network.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

The cost of implementing the first phase of this action over the period of one fiscal year is estimated to be \$85,000. This would cover the salary of a full-time contract person, expenses for production of resource and training materials, and the costs of presenting a series of educational workshops coastwide. Subsequent annual expenditures associated with a permanent ombudsman position would be approximately the same.

POTENTIAL FUNDING SOURCE(s):

Funds for the enhancement of coastal access programs are available to CZM under the Section 309 portion of its annual budget, and such funds should be assigned to this action.

TARGET DATE:

Phase One should be completed during FY 1996; Phase Two should be initiated in the following fiscal year.

FURTHER INFORMATION:

For further information and assistance, contact:

Coastal Zone Management Office
(617) 727-9530

CZM ACTION #12.4:

The Coastal Zone Management Office (CZM), in collaboration with the Department of Environmental Management and MassGIS, should prepare and distribute a statewide *Coastal Access Guide* to facilitate public access to the shoreline.

RATIONALE:

Many coastal states -- including neighboring Rhode Island -- have published handsome and informative access guides to public recreational facilities along the entire state shoreline. In the mid-80s, the Massachusetts Coastal Zone Management Office began a comprehensive effort of this kind, resulting in the publication of guidebooks for two regions (Boston Harbor and the North Shore); but funding limitations did not allow the project to extend to other areas of the coast and, with the passage of time, the original guides are now both out of date and out of print.

In the absence of a statewide access document, individual agencies have attempted to fill the informational gap by producing a variety of maps, booklets, and brochures describing their own facilities. A leading example of this is the guide to state boat launching ramps compiled by the Public Access Board within DFWELE (Public Access to the Waters of Massachusetts, undated). As a group, however, these assorted materials are not sufficiently plentiful or up to date, do not synthesize all relevant information for the coastal zone specifically, and are distributed in what might be called a passive manner (i.e., only in response to phone inquiries or walk-in requests at various field locations). Here again, deep cuts in the state budget have had a devastating effect. In 1991, for example, all public information staff positions were eliminated from the state's primary parks agency, the DEM Division of Forests and Parks.

Despite these fiscal constraints, several important strides have been made in recent years which indicate that the time has come to renew efforts to prepare a statewide coastal access guide. First, in 1990, DEM completed a comprehensive inventory of publicly-owned land along the coastline, which characterized each site not only in terms of ownership (federal, state, local, and non-profit), but also according to fees charged, parking facilities provided, and other attributes affecting availability to the public at large. Second, in 1992, DEM initiated a follow-up effort to incorporate these and other data on protected coastal open space into the Massachusetts Geographic Information System (MassGIS). In the not very distant future, this system is scheduled to be upgraded by including the database developed for the most recent State Comprehensive Outdoor Recreation Plan (SCORP). When these complementary efforts are complete, it should be a relatively straightforward

matter to produce a high quality shoreline access guide based on up to date map products and attribute information directly retrievable from the GIS.

RESPONSIBLE AGENT(s):

Having successfully undertaken similar projects in the past, CZM should assume lead responsibility for this action, with support from DEM and MassGIS in the area of database development.

IMPLEMENTATION STRATEGY:

Implementation of the access guide project should satisfy the following four objectives:

- the guide should include as many sites as possible that are owned by federal, state, and local governments and are suitable for recreation, both active and passive (i.e., beaches, parks, scenic and conservation areas, public piers, and town landings); properties held by nonprofit land trusts that are available for public use and enjoyment also should be included where feasible and appropriate;
- the maps should be carefully designed so as to facilitate "getting there," by showing connections from the regional highway system and public transportation as well as by naming selected local roadways and landmarks in a way that allows routes to the shoreline to be plotted with a minimum of confusion; ideally, the guide should be the only map document the public needs to obtain accurate directions to the properties in question;
- the maps should be accompanied by site-specific information describing allowed and restricted activities, facilities provided and fees charged, type and availability of parking, and any other attributes of relevance to potential users in deciding whether to visit the site; and
- the guide should be user-friendly in a physical sense (i.e., it should be sized to fit easily in a glove compartment or jacket pocket, have pages that lie flat when opened to a particular map, and be constructed of durable material.)

As a final note, it is important that a serious effort be made to

ensure that the guide be kept in print, be updated periodically, and be distributed widely. This may require some form of "turn-key" arrangement whereby ongoing responsibility for publication and distribution of the guide is transferred to another organization, such as the state university press or a private producer of recreational literature.

LEGISLATION REQUIRED:

Legislation is not required.

ESTIMATED COST:

\$150,000. The cost of preparing a three-part access guide for the entire shoreline of Massachusetts is estimated to be at least \$100,000, exclusive of printing costs which would be approximately \$50,000 for an initial printing of 10,000 copies.

POTENTIAL FUNDING SOURCE(s):

The Massachusetts Bays Program has already committed \$15,000 to this project and another \$55,000 has been allocated through the CZM and DEM budgets. Other sources within EOEA need to be identified to cover the remainder of the estimated project cost.

TARGET DATE:

The first volume of the public access guide (*The Massachusetts COAST GUIDE, Access to Public Open Spaces Along the Shoreline, Greater Boston Harbor and the North Shore*) was published during the summer of 1995. Other volumes should follow as soon thereafter as possible as the necessary GIS information becomes available.

FURTHER INFORMATION:

For further information and assistance, contact:

Coastal Zone Management Office
(617) 727-9530

EOEA ACTION #12.5:

The Executive Office of Environmental Affairs, in collaboration with coastal municipalities, should develop and implement an *Access-Via-Trails* program to enhance public access along the coast.

RATIONALE:

In the 20 years or so since public access to the coast was first identified as a critical issue for the Commonwealth, the amount of tidal shoreline in government or quasi-government ownership has increased from 265 to 363 miles, which is approximately one-quarter of the total frontage in the state. Despite this substantial accomplishment in land acquisition, however, it is evident that the goal of having a coast that is truly "open to the general public" remains elusive and largely unfulfilled in Massachusetts, as strong legal and political traditions still beget extensive exclusion on the roughly 1,000 miles of shoreline not under public control. Perhaps the most telling indicator of our acute need for better coastal access is that a majority of Massachusetts residents do *not* visit the coast on a yearly basis, despite the fact that so much of the population (86 percent) lives in counties either entirely or substantially within 50 miles of the sea.

If we are to meaningfully expand public access opportunities, Massachusetts cannot continue to rely exclusively on the conventional approach of acquiring more public parks and conservation lands at the water's edge. Such an approach is not only costly, but is also slow to achieve results. To quicken the pace of access enhancement, the state should give equal, or *greater*, attention to obtaining rights-of-way and other small-scale, dispersed access entitlements that do not require outright ownership of waterfront acreage. As proposed recently by the CZM Office, the organizing concept for such an effort should be that of the "coastal hiking trail," consisting of interconnected pathways running along the shoreline as well as to and along near-shore roadways. The portions of the trail crossing private property would be open to public passage by virtue of easements, permit conditions, and other legal/regulatory means. Also, points of origination would be located at small public parking lots or where on-street parking is available; or, to obviate the need to use a car at all, the trails could become part of a network of inland walking and bike paths connected, in turn, to nearby bus routes and rail stations. Leading examples of this approach include the proposed Bike-to-the-Sea route between Malden and Revere Beach, and the Rails-to-Trails route being planned in Newburyport.

With proper layout and careful attention to management issues, public use of such trails could occur in a manner that respects the privacy and other interests of waterfront property owners. Although the volume of foot traffic on any one trail would be expected to be relatively low, development of a number of trails in each community would make the shoreline far more approachable in the aggregate, with a relatively low expenditure of public funds. Another advantage of this innovative acquisition technique is that parking facilities, if needed at all, would be limited in size and could be located away from the immediate shoreline, further reducing costs and allowing for greater siting flexibility to avoid adverse environmental impacts.

The "access-via-trails" concept is very much in keeping with recent access-related developments in both the legislature and certain EOEa agencies. For example,

- the Chapter 91 Regulations of the Department of Environmental Protection (DEP) now require that public lateral access be allowed along the water's edge whenever a private pier or other structure extends into Commonwealth tidelands (i.e., below the low water mark);
- a complementary effort to open up the intertidal zone has been authorized by the legislature in the form of a statute directing the Department of Environmental Management (DEM) to initiate eminent domain proceedings to purchase "strolling" rights for the public during daylight hours; and
- the state's Public Access Board -- an entity that has heretofore concentrated on the construction of state boat ramps -- has the statutory authority to "designate locations of public access to great ponds and other waters within the Commonwealth and locations of trails and paths for...hiking...or other uses..." and to "construct such...parking areas...trails...and related facilities as may be designated by the Board..."

These existing state programs could, and should, be knit together in a coherent way to implement the concept of a coastal trails network, a process that would complement actions taken at the municipal level to reclaim historic rights-of-way.

RESPONSIBLE AGENT(s):

DEM is the logical agency to assume lead responsibility for this action, insofar as it represents an extension of programs already being implemented by that agency (e.g., developing trails in general and acquiring intertidal strolling rights in particular). Significant cooperation and support for the action should also be provided by municipal planners as well as CZM, DEP, and the Public Access Board.

IMPLEMENTATION STRATEGY:

The basic tasks that should be carried out to implement this action are as follows:

- Develop a set of guidelines for selecting priority segments of the shoreline and potential properties for easement acquisition and development of associated infrastructure (parking, signage, information materials, etc.); this will require, among other things, that a geographic database be established to identify opportunities for linking existing public recreation facilities and nearby public thoroughfares and pedestrian rights-of-way;
- Establish a list of high priority trail projects to be carried out when adequate funds become available;
- Develop and field-test a set of management guidelines to balance use versus conservation and public versus private interests in a variety of circumstances where public trail easements are secured on private shorefront property; this should build on existing land management guidelines developed in recent years by the EOEA Interagency Land Committee.

Recognizing that effective management is key to the success of any trails program, a special effort should be made to enlist the assistance of local residents and organization in providing grassroots management services, such as through adopt-a-trail projects and other comparable arrangements.

LEGISLATION REQUIRED:

Long-term funding of this program can be achieved under the Open Space Bond recently approved by the Legislature.

ESTIMATED COST:

A two-year effort to establish and properly staff the program is estimated to cost approximately \$85,000 per year. Subsequent expenditures would include the salary of at least one full-time staff person, together with capital costs that will vary depending on the number of projects carried out each year.

POTENTIAL FUNDING SOURCE(s):

Funds for the two-year startup phase, as well as for actual trail planning and development on an ongoing basis, will require a commitment of state monies from the Open Space Bond.

TARGET DATE:

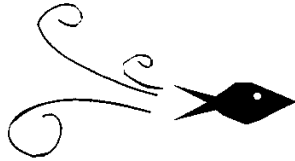
A coastal trails program should be ready for full-scale operation by the end of fiscal year 1997.

FURTHER INFORMATION:

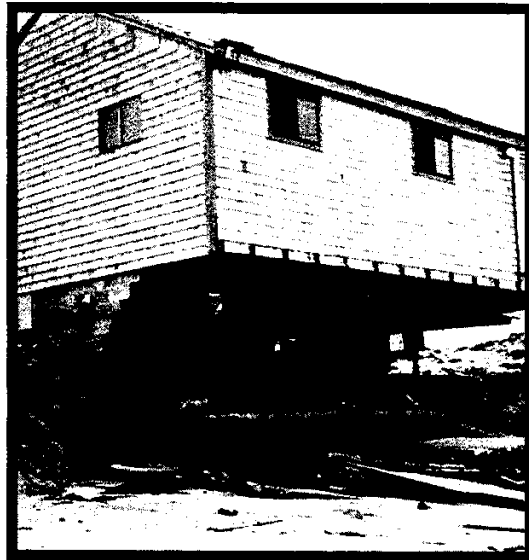
For further information and assistance, contact:

Department of Environment Management
(617) 727-3180

chapter V



**Planning for a
Shifting Shoreline**



ACTION PLAN #13

PLANNING FOR A SHIFTING SHORELINE

Nature is never completely static. The earth and its resident organisms are constantly changing and evolving. Because humans can actually *see* biological systems change, we are used to thinking of them as dynamic --individual organisms mature and die, populations rise and fall, entire ecosystems change and evolve. Geological features such as land masses, rivers, and shorelines are also dynamic, even though the rate of change is so slow that for practical purposes humans usually act as if these features were immutable. They are not. In fact, as recently as the last ice age (a mere blink on the geological time scale), the southeastern Massachusetts land mass extended seaward to the area now bounded by Block Island, Martha's Vineyard, Nantucket, and George's Bank.

The shoreline of the Massachusetts Bays region is still shifting. Like all shorelines, it is constantly being shaped and reshaped by natural forces -- currents and tides, fluctuations in sea level, storm erosion, shifts of barrier materials, and other phenomena. In some instances, changes to the coastal landform are best measured on a human scale rather than a geological scale. A barrier beach, for instance, can form and dissipate in a single human lifetime. Sea level rise plays an important role in shoreline change. Tidal data collected over the last century indicate that global sea level has been rising at an average rate of approximately 0.3 - 0.5 feet per century. Locally, however, relative sea level has been rising at about twice that rate. Sea level rise may accelerate dramatically within the next 100 years as a result of global warming, causing loss of uplands and wetlands, increased flooding, saltwater intrusion, and elevated groundwater tables.

Engineering can sometimes prevent, or at least slow, a natural shift in the shoreline. Sea walls, dikes, and floodgates may hold back rising sea levels or deflect eroding storm

waves. In many cases, however, the engineering "solution" merely creates a new set of problems. In some instances, deferential retreat -- rather than determined resistance -- may be the best response to a shifting shoreline.

The Massachusetts Coastal Zone Management Office (CZM) recently became one of the few agencies to address the issue of shifting shorelines by adopting a policy that requires developers in the 100-year floodplain to consider and plan for the effects of sea level rise. However, sea-level rise has not been completely addressed at the policy and management level, perhaps because the scientific basis for predicting the effects of global warming is uncertain.

However, even if the magnitude and timing of future shoreline shifts are uncertain, the fact that shorelines migrate is incontrovertible. Where development encroaches on unstable coastal landforms, property is certain to be threatened when the shoreline shifts from beneath it. Because an environmentally sound approach to shifting shorelines may at times conflict with the interests of oceanfront property owners, equity, property rights, and other social and legal issues will undoubtedly play a large role in management strategies for the shifting shorelines in the Massachusetts Bays region. A rational management plan, however, will give as much credence -- or more -- to existing scientific information which indicates that certain coastal areas are simply not suitable for development. The challenge will be to integrate social and scientific issues into an equitable and environmentally responsible management plan.

The following recommended actions are a starting point for achieving this.

MUNICIPAL ACTION #13.1:

Municipalities should adopt and implement strict development/redevelopment standards within FEMA A and V flood hazard zones and other areas subject to coastal flooding, erosion, and relative sea level rise.

RATIONALE:

Shoreline development can pose major environmental, economic, and public safety risks. The demand for waterfront property has resulted in inappropriate development in numerous high hazard areas - atop eroding coastal banks, adjacent to wetlands, on barrier beaches, and within floodplains. Such development has destabilized banks and dunes, accelerating problems of erosion and sedimentation. It costs the public millions of dollars annually in storm damage reconstruction, and threatens to impede the natural landward migration of essential tidal flats and wetlands as sea level rises relative to the land.

Although each coastal community has an evacuation plan, and local and state regulations limit some development in hazard areas, many communities have not adopted sufficiently strict construction and reconstruction standards to prevent the same types of development, and damage, from occurring in the future.

RESPONSIBLE AGENT(s):

A number of local authorities would be involved in this action, although primary responsibility would rest with the Planning Board, Board of Health, Conservation Commission, and local code enforcement officers (e.g., Health Agent, Building Inspector). Assistance is available from DEM's Flood Hazard Management Program, CZM, and the Regional Planning Agencies.

IMPLEMENTATION STRATEGY:

A core working group composed of representatives from the above boards should evaluate the adequacy of the community's existing regulations based on model performance standards for construction/reconstruction in high hazard areas, including areas subject to relative sea level rise. The performance standards should cover a broad range of building site, size, and setback considerations. Examples of performance standards include:

- *Except as specified to the contrary, no development or redevelopment shall be permitted in FEMA "A" and "V" flood zones. Existing structures may be reconstructed or*

renovated provided there is no increase in floor area or intensity of use. As an exception, where there is no feasible alternative, water-dependent structures and uses may be permitted subject to the approval of all permitting authorities.

- *Development and redevelopment on or within 100 feet landward of a coastal bank or dune shall be designed to have no adverse effect on the height, stability, or the use of the bank or dune as a natural sediment source. In areas where banks or dunes are eroding, the setback for all new buildings and septic systems to the top of the coastal bank or dune crest shall be at least 30 times the average annual erosion rate of the bank or dune. This rate shall be determined by averaging the erosion over the previous 30-year period at a minimum. In instances where shoreline erosion rates are indicative of bank/dune erosion rates, CZM shoreline change maps may be used in determining the setback.*

Among other things, performance standards should address those portions of the 100-foot buffer zone from a vegetated resource area that would be affected by a likely shift in shorelines, and should incorporate the best available shoreline, erosion, and sea level rise data. In particular, such standards should prohibit the construction of sea walls, revetments, and groins in order to allow for the occurrence of natural wetland and sediment migration processes.

According to Federal Emergency Management Agency (FEMA) and CZM officials, all "critical" facilities (e.g., wastewater treatment facilities, power generating facilities, hospitals, emergency response facilities) should be elevated or floodproofed to the 500-year flood elevation. Actual experience around the country and here in Massachusetts (e.g., Humarock in Scituate) has shown that the mapped 100-year flood elevation is not always correct, and severe storms may exceed that elevation.

While the 500-year flood elevation is not actually specified in Federal Executive Order 11988, the intent to plan or reconstruct critical facilities to a higher level of protection permeates the E.O. A sound reason for choosing the 500-year flood elevation is that it is calculated and published in all community Flood Insurance Studies and thus is readily available. The published 500-year flood elevation does not

include wave height; however, a critical facility should not be located in a Velocity zone where a wave height calculation would be needed. If a critical facility already exists in a Velocity zone, the 500-year elevation including wave height should be calculated, and that subsequent height should be used for floodproofing and elevation criteria.

With respect to sea level rise, a one-foot relative sea level rise should be considered in all planning and construction in FEMA-mapped A-zones; however, a 2-foot relative sea level rise should be used in all Velocity zones.

For more detailed information and assistance regarding performance standards for development activities in coastal hazard areas, contact CZM and DEM's Flood Hazard Management Program.

LEGISLATION REQUIRED:

Implementation of this action will require amending existing municipal development/redevelopment regulations to incorporate stricter performance standards in high hazard coastal areas.

ESTIMATED COST:

In general, the cost of developing and adopting stricter performance standards should be modest. Model performance standards for high hazard areas are available from CZM, DEM, and the Regional Planning Agencies. These model standards can either be adopted in their present form or modified to reflect specific local needs.

The cost of delineating high hazard areas, including lands subject to sea level rise, on local assessor's maps is estimated to be \$1,500 - \$2,500 per community.

POTENTIAL FUNDING SOURCE(s):

TARGET DATE:

1996/1997. This is a high priority action from a public safety, environmental, and economic standpoint and should be implemented as soon as possible.

FURTHER INFORMATION:

For further information and assistance, contact:

Coastal Zone Management (CZM)
(617) 727-9530
DEM Flood Hazard Management Program
(617) 727-3267
Your area's Regional Planning Agency

DEM ACTION #13.2:

The Department of Environmental Management should assist communities in the development of effective *Floodplain Management Regulations*.

RATIONALE:

Floodplains serve as a natural means of flood control by absorbing and retaining water during periods of excessive precipitation and runoff. Inappropriate development in floodplains can threaten public health and safety, destroy or degrade important riverine habitat, and impair water quality. By providing information and "hands-on" technical assistance on floodplain management to communities, the State's Flood Hazard Management Program can help communities guard against financial losses due to flooding while protecting public safety and natural resources.

As a requirement for participation in the National Flood Insurance Program (NFIP), communities must adopt locally enforceable floodplain zoning bylaws to regulate development activity in the 100-year floodplain. Local floodplain bylaws that do not meet FEMA's minimum standards for floodplain management can jeopardize a community's continued participation in the NFIP.

Participating communities also must adhere to several state regulations that in some instances are more restrictive than the federal guidelines. These include: 1) State Building Code (780 CMR 2102.0, "Flood Resistant Construction"); 2) Wetlands Protection Act Regulations (310 CMR 10.00); and 3) State Environmental Code, Title 5 (310 CMR 15.00). In order to ensure community compliance, DEM's Flood Hazard Management Program staff will review local floodplain bylaws and recommend changes consistent with prescribed NFIP and state regulatory standards.

RESPONSIBLE AGENT(s):

DEM's Flood Hazard Management Program (FHMP) staff will be responsible for this action.

IMPLEMENTATION STRATEGY:

In order to promote the sound use of floodplains and to help safeguard Massachusetts residents against possible losses to life, health, and property due to flooding, DEM:

- maintains a reference file of current Flood Insurance Rate Maps (FIRMs) which identify known flood hazard areas in Massachusetts communities. These maps help public

officials and citizens identify flood-prone areas and learn of the risks local flooding may pose;

- conducts Community Assistance Visits (CAVs) and Community Assistance Contacts (CACs) with municipal officials to provide information and assistance on local floodplain management;
- distributes the State Building Code design regulations for floodplains (780 CMR 2102.0) and FEMA manuals of appropriate floodplain construction techniques to minimize flood damage to those structures permitted in the floodplain;
- provides information on how to properly evaluate and floodproof structures already in the floodplain and to discourage inappropriate structural development; and
- provides model bylaws encouraging communities to join the National Flood Insurance Program and adopt or update zoning overlay bylaws to regulate land use in floodplains.

As part of its Community Assistance Visits and Community Assistance Contacts, DEM's FHMP staff will obtain and review the floodplain district section of a community's local bylaws. Based on its findings, DEM will forward specific recommendations for bylaw changes in follow-up correspondence to the community. Bylaw development assistance is a specifically identified task in the FHMP's Statement of Work, negotiated with FEMA each fiscal year. Under this task, any community that has received recently updated Flood Insurance Rate Maps or has requested technical assistance will be helped with its floodplain management bylaw.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

When offered under the specific task of "bylaw review," the estimated cost to DEM of providing technical assistance is \$375 per review. When provided as part of a CAV or CAC, the cost of assistance is folded into the total cost of that particular task. In both cases, the assistance is offered free of

charge to the community.

POTENTIAL FUNDING SOURCE(s):

Funding is available to DEM through the FEMA CAP program (75% federal, 25% state).

TARGET DATE:

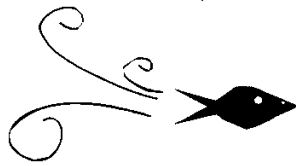
Ongoing.

FURTHER INFORMATION:

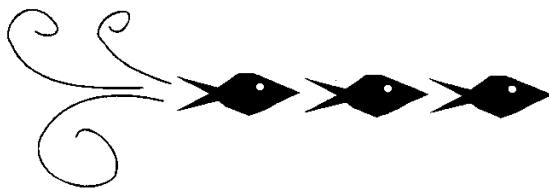
For further information and assistance, contact:

DEM Flood Hazard Management Program
(617) 727-3267

chapter V



**Managing Local
Land Use and
Growth**



ACTION PLAN #14

MANAGING LOCAL LAND USE AND GROWTH

The preceding list of recommended actions clearly suggest that many beneficial uses of Massachusetts Bays are threatened by population growth and the appurtenant development of rural or agricultural land in the Bays' watershed. In order to protect the Commonwealth's coastal heritage, communities in the Bays' watershed must take action to manage local land use and growth.

The lure of the sea has attracted many residents to the coast. Approximately 3.8 million people now live in the Massachusetts Bay drainage basin, and the number is growing. A disproportionate amount of this growth is occurring in coastal communities. Between 1970 and 1990, population on the Upper North Shore grew by 20 percent, and population on the South Shore increased 57 percent. Residential development on Cape Cod has been particularly rampant -- in that same 20 year period, the Cape's population nearly doubled -- from 69,000 to 134,000. The number of permanent residents in the town of Brewster almost quadrupled. In all, the amount of land in residential use in the Massachusetts Bays drainage basin increased by more than 20 percent.

Population growth exacerbates a wide array of environmental problems, but perhaps nowhere more so than in the coastal zone. Residential development impacts the Bays in a number of ways. Impervious surfaces such as roofs, roads, and driveways increase the volume, velocity, and quality of stormwater runoff. More people produce more sewage, which in turn strains sewage treatment plants and contributes to septic system pollution. And greater populations put increased pressure on fragile coastal habitat and recreational resources. These human impacts are especially destructive in small embayments and other localized areas subject to intense human activity.

Without effective growth management and land use planning, regulations and pollution control technologies are likely to be of limited value. Responsible land use planning is predicated on the government's broad power to protect and enhance the health, safety, and welfare of the public.

Traditionally, land use planning and decision making have been the domain of municipal government. Communities have available a number of regulatory and nonregulatory tools with which they can protect coastal resources from the pressures of growth and development. These include but are not limited to:

- *Zoning bylaws and ordinances:* Massachusetts General Laws Chapter 40A (Zoning Act) defines the limit of a municipality's power to establish zoning districts. In order to reap full benefits from zoning ordinances, a community needs to determine its capacity to absorb future residential and commercial development. When used in conjunction with a carrying-capacity/buildout analysis, zoning can greatly enhance water quality protection.
- *Subdivision control:* unlike zoning bylaws, which focus on land use, the Commonwealth's subdivision regulations (Massachusetts General Laws Chapter 41) address engineering concerns associated with new development, such as street specifications, utility placement, and traffic patterns. Protecting water quality through subdivision regulations is therefore more limited than through zoning bylaws. There are, however, a few channels which should not be overlooked. For example, Planning Boards can adopt regulations which mandate on-site stormwater management or which restrict the application of lawn fertilizers. Similarly, local Boards of Health have the authority (under Section 81-U of the Subdivision Control Law) to negate subdivision plans that pose a significant risk to public health.
- *Buffers and water protection districts:* undeveloped land is generally more permeable and can accommodate stormwater more readily than developed land. To promote percolation and natural filtration of stormwater, communities may mandate a vegetated upland buffer adjacent to surface waters such as streams and ponds. Similarly, they may adopt an ordinance or bylaw which restricts potentially harmful activities near a waterway or wetland.

- *Performance standards:* if a certain resource area can absorb some contaminants without experiencing unacceptable levels of deterioration, a community may decide to limit pollutant loadings to that critical level. Performance standards allow individual development projects to contribute *some* pollutant loadings while ensuring that the cumulative loadings from the surrounding drainage area do not exceed the area's carrying capacity.
- *Cluster design:* the pattern of residential development in the Massachusetts Bays region is in some ways as troubling as its growth. Developers are consistently avoiding established urban centers in favor of rural or agricultural land, resulting in suburban sprawl that is more difficult to mitigate. Cluster design, an alternative to the standard grid-style development pattern, allows for more open space and larger buffer zones between residences and critical resource areas.

- *Transfer of ownership:* environmentally sensitive land areas are often best protected when they are publicly owned. A community may identify some parcels that are so significant as to warrant outright purchase using municipal funds. In order to accrue tax savings, the landowner may sell the land to the community below market value, or in certain cases, donate the property outright.
- *Tax deferments and easements:* land taxes are generally levied against the market value of a developable land parcel, regardless of the its use. Tax reductions can prompt land owners to reserve their land as open space. A land owner may also sell or donate an easement which restricts the owner's right to develop the land.

The following action provides the basis for a community to better manage its growth and sensitive environmental resources.

MUNICIPAL ACTION #14.1:

Municipalities should develop and implement *Local Comprehensive Plans* (LCPS) which: 1) direct development into areas in the community capable of absorbing the impacts of growth and its associated facilities; and 2) preserve and protect the community's important natural resources.

RATIONALE:

For years, the pattern and pace of development in many communities has been driven more by "market" conditions than by well-conceived plans for growth. Too often, local zoning regulations serve as blueprints for development that does not sufficiently recognize environmental sensitivities and constraints. Such development has resulted in the loss and fragmentation of valuable open space and wildlife habitat, and the pollution of coastal and inland waters. It also has destroyed irreplaceable scenic vistas and blocked public access to important waterfront areas. Further development can be expected to occur in an insensitive, ad hoc fashion unless well-conceived, coherent *Local Comprehensive Plans* are developed and implemented within the Bays' communities.

RESPONSIBLE AGENT(s):

A Local Planning Committee, under the direction of the Planning Board, would generally be responsible for this action. This committee should include representatives from a variety of local boards (e.g., Selectmen, Health, Conservation), as well as from the business community and general public. Planning assistance is available from the Regional Planning Agencies.

IMPLEMENTATION STRATEGY:

Local comprehensive planning should be an open, interactive process that invites the participation and input of diverse sectors of the community. The Cape Cod Commission has developed guidelines (*Local Comprehensive Plan Guidelines*, February 1993) to help Cape communities through this process, and other Massachusetts Bays communities can use these guidelines as a model in developing their own *Local Comprehensive Plans*. The guidelines prescribe a straightforward planning process, as follows:

Designate a Local Planning Committee



Assess Available Planning Resources



Outline the Planning Process



Formulate a Work Program



Prepare a Citizen Participation Program



Develop a Community Vision and Goals



Coordinate with Neighboring Communities



Draft the *Local Comprehensive Plan* (LCP)



Hold Public Hearings



Complete and Adopt the final LCP



Implement the *Local Comprehensive Plan*
(ongoing)

At a minimum, *LCPs* should address each of the following subject areas: land use/growth management; natural resources (water resources, coastal resources, wetlands, plant and wildlife habitat); economic development; community facilities and services (transportation, solid and hazardous waste management, capital facilities/infrastructure, energy); affordable housing; open space and recreation; and historic preservation/community character.

Other local plans, such as Municipal Harbor Plans certified by CZM (see Action Plan #12.1) and Open Space Plans certified by the EOEADivision of Conservation Services (see Action Plan #3.1), should not be duplicative of the *LCP*, but, rather, should be a component of, and complement, the *Local Comprehensive Plan*.

LEGISLATION REQUIRED:

Once produced, a *Local Comprehensive Plan* is adopted by a vote of town meeting or other local legislative body. In the case of Cape Cod, the *LCP* must also be submitted to the Cape Cod Commission for certification of its consistency with the Regional Policy Plan. Implementation of the *LCP* may require a number of local regulatory changes, including amendments to the zoning bylaw, and adoption of new or revised land use regulations, performance standards, and

building codes.

ESTIMATED COST:

\$50,000 - 200,000+. The cost of developing a *Local Comprehensive Plan* can vary widely, depending on the complexity of local growth patterns and development issues, and the availability of professional staff and qualified volunteers to perform the work.

POTENTIAL FUNDING SOURCE(s):

Funding and technical assistance for Cape Cod communities are available from the Cape Cod Commission. At present, the other Regional Planning Agencies are not able to provide funds to their member communities, but can offer limited technical assistance. A bill currently before the Legislature (the Growing Smart Bill), would provide state funding for Local Comprehensive Plans.

TARGET DATE:

1996 - 2001. A *Local Comprehensive Plan* is the cornerstone of a community's overall planning and development initiatives. It is an expression of the community's vision of its future and a guide to making the many public and private decisions that shape that future. Its development is a significant undertaking that may take several years or more to complete. Accordingly, communities should begin the local comprehensive planning process as soon as possible.

FURTHER INFORMATION:

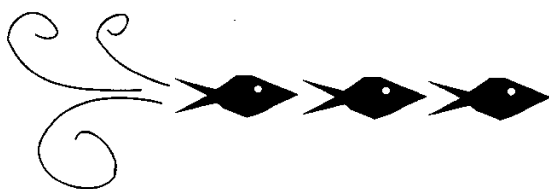
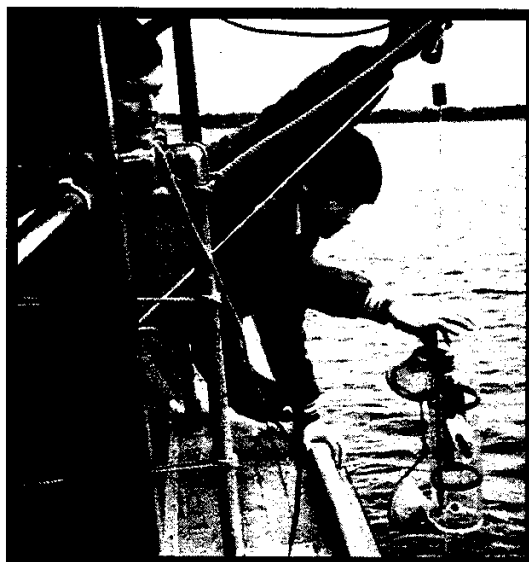
For further information and assistance, contact:

Your area's Regional Planning Agency
NRCS Community Assistance Unit
(508) 295-1481
Your County Conservation District

chapter V



Enhancing Public
Education and
Participation



ACTION PLAN #15

ENHANCING PUBLIC EDUCATION AND PARTICIPATION

15A. EDUCATING TEACHERS, STUDENTS, AND THE PUBLIC ABOUT THE BAYS

The word "education" means different things to different people. What follows is a brief definition to help clarify what the word means in a particular context.

FORMAL EDUCATION is education that is highly organized and usually certified by government authority. Traditionally, it is divided by grade: kindergarten through grade 12. In the past, these grades have been subdivided into elementary and secondary, with secondary beginning at the 7th grade. More recently, three categories are recognized:

Primary school: kindergarten through grade 4
Middle school: grades 5 through 8
High school: grades 9 through 12.

"Pre-K" refers to schooling prior to kindergarten; i.e., nursery school and day care. "Post-secondary" refers to college and graduate school, and is also considered "formal."

NON-FORMAL EDUCATION refers to educational services usually provided by non-profit organizations such as museums, libraries, aquariums, galleries, private sites of significance, and government agencies (e.g., national and state parks, historical sites, wildlife refuges, monuments). These kinds of organizations frequently provide on-site programs for school groups and the general public. Many are involved in curriculum development and workshops for teachers.

There are also non-formal educational resources lying in a vast, ill-defined area offered by the media: newspapers, books, magazines, radio, and television. This is the main source of education for the general public. Further, there are "adult education" courses offered as non-credit courses by schools, colleges, and universities (e.g., Elderhostel and extension services).

Most people regard the concept of education from a "formal" point of view; but, in fact, most knowledge is imparted through the non-formal route, and this is particularly true of matters concerning environmental science and environmental issues. Environmental education, as such, has only recently entered the curriculum of public schools where motivated teachers have taken advantage of its integrating benefits. At the same time, there are encouraging efforts being made by

the Executive Office of Environmental Affairs (EOEA) and the Department of Education (DOE) in clarifying the "Benchmarks of Environmental Literacy" presented by the Secretary's Advisory Group on Environmental Education (SAGEE). The Massachusetts Bays Program supports these state initiatives and encourages the introduction of the philosophy of the MBP into the classroom.

Meanwhile, the non-formal sector has been quick to recognize this unfilled niche and has developed some excellent programs for the public. While the non-formal sector will continue to provide focused educational programming, mechanisms must be provided to the public school systems to develop and enhance the role of environmental education during the brief period that children spend in a formal school setting. This is particularly true if the general population is to be expected to grasp the holistic, ecosystem-level concepts necessary to understand complicated Massachusetts Bays issues.

The action plans of the CCMP, therefore, require educational efforts "aimed at developing a citizenry that is aware of and concerned about the total environment and its associated problems and which has the knowledge, attitudes, motivations, commitments, and skills to work individually and collectively toward the solution of current problems, as well as the prevention of new ones" (*On the Way To Environmental Literacy: Report of the Benchmarks for Environmental Literacy Project of the Secretary's Advisory Group on Environmental Education*).

In each of the Action Plans presented previously, there is a significant role for a public education/information strategy. However, the specifics of such a strategy will depend upon the particular location of the actions to be taken, the resources available, the education level of the population involved, the extent of on-going efforts, and the commitment of the public. A specificity based on so many variables is obviously beyond the scope of this document, particularly since, in some cases, there are excellent efforts already in place.

Nevertheless, the Massachusetts Bays Education Alliance (MBEA) has developed a series of educational action plan

strategies, articulated below, which emphasize: 1) information that is easy to understand and can be applied to local situations; 2) individual responsibility for pollution of Massachusetts Bays watersheds and waterways; and 3) actions each person can take to minimize and control contaminants from reaching surface and groundwaters. Preventive methods include: developing and distributing relevant education materials; workshops for public officials, organizations, and educators; storm drain stenciling projects; and proper disposal of hazardous materials. Citizens should know what to look for with respect to polluted water and how to report water not meeting standards for its designated use. Toward this end, volunteer citizen groups should be educated and trained to monitor waterways and report data to authorities who can verify the data and set appropriate preventive and remedial actions in motion.

MBEA has developed the following recommendations and strategies, matched to the Action Plan categories previously covered. They fall under the general themes of protecting and enhancing natural resources, reducing or preventing pollution, managing wastes and human activities, and planning for shifting shorelines.

Protecting and Enhancing Shellfish Resources: Before citizens can take action to protect a vital resource, they must first know the resource exists and is important to the community. Each year local papers could publish a listing of shellfish resources and their yearly economic value to the community and region, along with potential pollution threats that might close shellfish areas and what is being done to keep these areas open. An education booklet might be given out with shellfish permits, placed in fish markets, and used in classrooms. This booklet could describe basic concepts related to shellfish biology, requirements for water quality and how it is tested, how individual actions and community decisions create potential pollution that leads to closures, and what actions are needed to re-open closed shellfish beds and keep them open.

Protecting and Enhancing Coastal Habitat: An inventory of coastal habitats with local photographs would help local Conservation Commissions educate community residents in the value of local habitats. A sense of pride in keeping these habitats healthy needs to be nurtured. Workshops and field trips on the biology and economic value of these habitats would prepare citizens for involvement in the planning, development, and implementation of bylaws and other measures for protecting water resources. The use of student monitoring studies, with reports to the community, would heighten student understanding of the need and mechanisms for protecting coastal habitats. For example, local fish runs could be a focus for research, monitoring, and planning for protection and maintenance.

Reducing and Preventing Stormwater Pollution: Educating citizens about the different sources, types, and

effects of pollutants that enter and travel through storm drains to waterways can lead to changes in personal practices. For example, storm drain stenciling can alert people to the consequences of improper disposal of waste products, such as litter and used motor oil.

Reducing and Preventing Toxic Pollution: In addition to education, media strategies can help citizens and businesses understand and develop practices to reduce, reuse, substitute, store, and properly dispose of toxic wastes. The development and use of incentives, such as positive publicity for businesses and awards to schools or students who carry out successful projects, would magnify and multiply these efforts.

Reducing and Preventing Oil Pollution: Proper disposal of used oil offers economic and ecological benefits to the taxpayer. Outreach educators and media specialists can develop strategies to address the consequences of "what goes into the ground will probably enter the drinking water supplies or aquatic habitats." Community leaders and environmental advocates can provide citizens with mechanisms to elicit widespread support for community oil collection and monitoring programs.

Managing Municipal Wastewater: Education strategies are needed to increase citizen understanding of aquifers and groundwater, and how these may be affected by on-site sewage disposal systems. The value of the recent upgrading of Title 5 regulations, both to the individual and to a community's water resources, needs to be communicated. In turn, property owners with septic systems should receive information to enable them to maintain their systems properly and to practice household waste prevention. Everyone needs education on the understanding of, and need for, alternative technologies as viable options to replace or upgrade failing or substandard on-site systems.

With respect to centralized sewage treatment facilities, existing curricula and outreach materials are available that describe the character of specific pollutant threats, explain the responses that have been written into the environmental regulations, and encourage citizen involvement in, and support for, enforcement of discharge permits. Engineers and scientists from local wastewater treatment plants should be encouraged to cooperate with citizen groups and schools to provide access to the plants and engage the public in water testing projects.

Managing Boat Wastes and Marina Pollution: The MBP and CZM should continue to distribute timely materials that give the boater clear instructions on how to properly dispose of boat wastes. Power squadron courses, marinas, boat license mailings, and public service announcements can be the vehicles for disseminating this information. As a means of promoting public awareness, the volume of properly collected pump-out effluent that contributes to shellfish bed openings could be widely broadcast.

Managing Dredging and Dredged Materials Disposal: CZM should continue to provide print materials to the public, media, Local Governance Committees, and educators on the purpose, importance, and need for conducting and monitoring dredging activity.

Reducing Beach Debris and Marine Floatables: Everyone who lives within the Massachusetts Bays watershed can help reduce shoreline debris and marine floatables. Public participation programs and outreach materials coordinated by CZM through the annual statewide "CoastSweep" campaign, "Sponsor-a-Beach" programs by local schools or youth groups, municipal recycling projects, and recycling bins strategically placed on waterfronts all can contribute to ongoing beach clean-ups.

Managing Nitrogen-Sensitive Embayments: Public education programs can address the importance of the nitrogen cycle to all life, and what happens when that cycle becomes out-of-balance. The consequences of nitrogen-enrichment are particularly apparent in shallow embayments. Individual actions that contribute to this imbalance need to be understood. Proper household and business practices, as well as the use of alternative technologies, can help limit nitrogen inputs to the Bays. Organizations and educational institutions can work collaboratively to promote creative land-use planning, and to support local bylaws which protect water quality.

Enhancing Public Access and the Working Waterfront: The right of public and commercial access to a common resource where the impacts are controlled can be important to the economy of an area. It also builds appreciation that leads to the protection of a natural resource. Hence, an initiative is underway by CZM and DEM to complete a set of public access guides (*The Massachusetts COAST GUIDE*) to facilitate use and enjoyment of the coast. In addition, improved access to the intertidal zone from Provincetown to Salisbury, MA is being pursued through the Sea Path Program at DEM. Environmental educators and organizations, including the Massachusetts Bays Education Alliance, can use these initiatives to help provide meaningful outdoor experiences to students.

Planning for a Shifting Shoreline: This issue has been neglected at all educational levels due to a lack of consensus on: 1) the scientific explanations for the causes of coastal processes leading to erosion and accretion, and 2) how best to address the rights of those directly affected. The public needs to be better informed about the scientific aspects of erosion, sedimentation, and sea level change, as well as the impacts of engineered solutions versus letting nature "take its course." Enhanced public education could improve community and state responses to storm events, influence community long range planning strategies and the issuance of building permits, and heighten the public's understanding of the 100-year flood zone and related flood insurance rate maps

and premiums.

Managing Local Land Use and Growth: Education programs can be developed that increase the public's understanding of local bylaws and regulations which serve the common good by promoting the economic and ecological sustainability of our rich and diverse Massachusetts Bays resources.

Following are some generalized statements of environmental literacy developed by the Massachusetts Bays Education Alliance. They apply to both the previous recommendations and strategies, as well as to the education action plans relating to the Massachusetts Bays.

- People should understand the role of the Massachusetts Bays in the economy and in the environmental health of the individual, the municipality, the watershed and region, the state, and New England.
- People should have a basic understanding of the hydrology of watershed systems, particularly the role of surface water and groundwater inputs to the Bays.
- People should understand that water and wastewater treatment procedures are costlier than preventing contaminants from entering the surface and groundwaters in the first place.
- People should understand that a sustainable ecological and economic environment can be achieved if human activities and land use practices are properly balanced with the needs of natural systems.
- People can best have a positive effect on the Bays environment by thinking globally and acting locally.
- People should understand the premise of the 2nd Law of Thermodynamics, wherein all systems tend toward disorganization and eventual collapse unless energy is invested to keep them functioning.
- People should understand what is meant by "pollution", what its effects are, and what actions individuals can take to enhance the effectiveness of a particular counteraction.
- People should understand and be capable of using the political process for the solution of environmental problems.
- People should understand the concepts of compromise in the political process with respect to "best management practices."
- People should be cognizant of the kinds of grass-roots organizations through which their interest and input can affect decision-making.

The following Action Plans developed by the Massachusetts Bays Education Alliance are an important first step toward educating the Bays' many citizens - teachers, students, and general public - about the Bays' resources and their own role in protecting them.

DOE ACTION #15A.1:

The Department of Education, in collaboration with the Executive Office of Environmental Affairs, should continue to develop and integrate environmental education as an important component of the curriculum in the public schools of the Commonwealth, making broad use of the Benchmarks for Environmental Education developed by the Secretaries' Advisory Group on Environmental Education (SAGEE).

RATIONALE:

The development and integration of environmental education into the schools would benefit from coordinated direction and leadership that recognizes the importance of environmental literacy to the Commonwealth.

RESPONSIBLE AGENT(s):

Massachusetts Department of Education

IMPLEMENTATION STRATEGY:

Provide resources, workshops, conferences, fact sheets, events, and media opportunities to facilitate the environmental education process for administrators and teachers.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

\$100,000

POTENTIAL FUNDING SOURCE(s):

Massachusetts Department of Education

TARGET DATE:

1996/1997 to develop program; program integration and implementation ongoing.

FURTHER INFORMATION:

For further information and assistance, contact:

EOEA Education Coordinator
(617) 727-9800, x218
MBEA Coordinator
c/o 1-800-447-BAYS

EOEA ACTION #15A.2:

The Executive Office of Environmental Affairs should continue to work closely with the Department of Education through the Secretaries' Advisory Group on Environmental Education (SAGEE) in order to develop a strategy for the implementation of the "Benchmarks for Environmental Education". Further, EOEA should continue to place a priority on the role of environmental education and provide adequate staffing to insure that appropriate state leadership is maintained.

RATIONALE:

There needs to be a strong voice in the executive branch that can provide the leadership necessary to focus the already-present governmental resources on the role of environmental education on resource sustainability. The Benchmarks for Environmental Education would provide guidance for teaching resource protection and enhancement, pollution reduction, and watershed planning and management. This will provide a framework for using the CCMP Educator's Resource Guide, MBP research, and fact sheets in environmental stewardship in both formal and non-formal education settings.

RESPONSIBLE AGENT(s):

EOEA would be responsible for this action.

IMPLEMENTATION STRATEGY:

- Integrate the Benchmarks for Environmental Education into the CCMP resource materials, and materials provided by non-profit and non-government organizations, and government agencies;
- Integrate into formal and non-formal education the use of the CCMP Educator's Resource Guide, MBP print materials, and MBP/EOEA stewardship projects and programs such as: Shoreline Surveys, CoastSweep, water quality monitoring, storm drain stencilling, toxics use reduction and solid waste recycling programs, and SeaPath support; and

- Coordinate and promote watershed and Bays stewardship through regional workshops, conferences, events, media, and policy and regulatory enforcement.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

Staff time for workshops, events, and material production; and the cost of materials.

POTENTIAL FUNDING SOURCE(s):

EOEA annual operating budget.

TARGET DATE:

1996 to develop strategy.

FURTHER INFORMATION:

For further information and assistance, contact:

EOEA Education Coordinator
(617) 727-9800, x218
MBEA Coordinator
c/o 1-800-447-BAYS

EOEA ACTION #15A.3:

The Executive Office of Environmental Affairs, in cooperation with the Department of Education, should continue to develop a grant relationship with the National Science Foundation and other funding agencies in order to provide technological outreach aimed at enhancing environmental literacy. The goal is to make resource and curriculum materials widely accessible and to provide ongoing coordination among the various members of the education community. The Massachusetts Bays Program represents an important aspect of the total environmental picture and should play a key role in this effort, helping to establish a unified voice to speak for environmental education concerning the Bays region.

RATIONALE:

Coordinated efforts on behalf of environmental education are needed to strengthen the amount and quality of projects, materials, and activities available across the Massachusetts Bays region and the Commonwealth.

RESPONSIBLE AGENT(s):

EOEA, MBP, and UMass Extension would share responsibility for this action.

IMPLEMENTATION STRATEGY:

- Train teachers and educators how to access information on the Bays and their watersheds and how to communicate this information to students and the public; and
- Staff a position to keep Bays-related information current and accessible.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

\$45,000/year.

POTENTIAL FUNDING SOURCE(s):

UMass Extension; National Science Foundation.

TARGET DATE:

1996

FURTHER INFORMATION:

For further information and assistance, contact:

EOEA Education Coordinator
(617) 727-9800, x218
MBEA Coordinator
c/o 1-800-447-BAYS

EOEA/DOE ACTION #15A.4:

EOEA and DOE should empower exemplary teachers, administrators, and/or schools, who demonstrate the competence, to carry out formal and non-formal environmental education initiatives that complement the Commonwealth's environmental education programs.

RATIONALE:

School workers in the environmental "trenches" need to be recognized and rewarded for their contributions to environmental education.

RESPONSIBLE AGENT(s):

EOEA and DOE would be responsible for this action.

IMPLEMENTATION STRATEGY:

- Continue the nomination process and the Secretariats' award ceremony during Earth Week/Month; and
- Provide local press opportunities for each award.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

To be determined.

POTENTIAL FUNDING SOURCE(s):

EOEA and DOE operating budgets.

TARGET DATE:

1996 and annually thereafter.

FURTHER INFORMATION:

For further information and assistance, contact:

EOEA Education Coordinator
(617) 727-9800, x218
MBEA Coordinator
c/o 1-800-447-BAYS

MBEA ACTION #15A.5:

The Massachusetts Bays Education Alliance should continue and expand its current efforts to build a community of educators who can ably teach about and promote the protection of the Massachusetts Bays, their shores, and watersheds.

The Massachusetts Bays Education Alliance (MBEA) was formed in 1993 to help create a community of educators who can teach students and the public about the Massachusetts Bays, their shores, and watersheds, and how to responsibly use and protect these valuable resources.

The following policies agreed to by the MBEA steering committee can serve as actions to be accomplished under the aegis of the CCMP:

1. The Alliance should continue to encourage teachers and their schools to make use of their local watersheds, shores, and bays as teaching resources, guided by the CCMP and its Action Plans;
2. The Alliance should continue to focus its efforts on the educators of the region by promoting marine, coastal, and freshwater education;
3. The Alliance should continue to encourage innovative teaching based on the latest research as it relates to the Massachusetts Bays;
4. The Alliance should continue to facilitate the use of watersheds, shores, and bays by establishing working connections among the schools and appropriate local organizations, agencies, and municipal departments;
5. The Alliance should continue to promote the sharing of resource materials from the myriad of watershed, shores, and bays education sources that permeate the region but which are frequently difficult to locate and access;
6. The Alliance should continue to seek to achieve the goals of its mission statement in a coherent fashion and on a sustainable, cost-effective basis across the region of 161 cities and towns that comprise the watersheds of the Massachusetts and Cape Cod Bays; and

7. The Alliance should continue to support the State's educational reform by: 1) serving as a catalyst for school intervention strategies that integrate new education initiatives (e.g., PALMS Program) with a watershed, shores, and Bays-based education focus; 2) facilitating the use of Massachusetts Bays watershed concepts at a functional or operational level; and 3) encouraging the establishment of a full-time Environmental Education Coordinator position within the Department of Education to coordinate formal environmental education efforts.

Toward this end, the Massachusetts Bays Education Alliance is producing a resource guide that will include interdisciplinary activities illustrating information from the CCMP. It will be written to the middle school level (grades 5-9), with suggestions for high school activities as well. Along with activities, it will feature a listing of MBP Action Grants and research materials, recommended curricula developed by host institutions, and helpful references and other resources characterizing the Bays' watersheds.

The Education Alliance also will contribute to the formation of partnerships among organizations and institutions with shared environmental education interests, such as the one established with U./Massachusetts Extension, Natural Resources and Environmental Conservation Program, and those recently formed with U./Massachusetts (Boston) - Urban Harbors Institute, Graduate School of Education, Institute for Learning and Teaching, and the Harbor Explorations Institute.

CAN ACTION #15A.6:

The Coastal Advocacy Network should continue to serve as a vehicle for bringing information to and from the government on environmental issues affecting the Bays, with a particular emphasis on proposed projects or regulatory changes.

The Coastal Advocacy Network presently serves as the primary vehicle for bringing information to and from all levels of government on various environmental issues, with a particular emphasis on proposed projects or regulatory changes. The Network's educational approach is open-forum and informal, serving to educate both citizens and government on priority, and relatively immediate, issues and actions affecting the environment.

The Coastal Advocacy Network was formed in 1993 in response to the Massachusetts Bays Program's need to bring citizen input into the development of the CCMP. The Network meets monthly to discuss priority issues, many of which have been brought to the MBP Management Committee for discussion and possible inclusion in the CCMP. The so-called "megaprojects", for example, were developed with the input of the Network through group meetings and focus group sessions, and consensus was reached among interested parties as to the language and action recommendations. The Network will continue to serve as a vehicle for information exchange among the citizenry and the government.

The Network's mission is as follows:

"Recognizing the Bays as an interconnected ecosystem that is shared and affected by the communities that surround it, the Coastal Advocacy Network is dedicated to the protection, restoration and celebration of the marine and coastal resources of Massachusetts and Cape Cod Bays. Consisting of local or regional environmental advocacy and educational non-governmental organizations from the communities surrounding the Bays, Network members are committed to improving the understanding and management of Massachusetts Bays and its constituent ecosystems. The Network has been formed in order to allow an exchange of information and ideas among members, to facilitate the identification and advocacy of issues and priorities that are shared by all members, and to develop common ground relative to potentially divisive policy disputes. The Network operates through a consensus process and is affiliated with the Massachusetts Bays Program, a local, state, and federal effort, under the National Estuary Program, focusing research, planning, and education efforts on protection and enhancement of Massachusetts and Cape Cod Bays."

BUG ACTION #15A.7:

The Massachusetts Bays Business and Users Group (BUG) should continue to provide a public forum for the exchange of information and ideas on CCMP development and implementation among the Bays' business community and resource users.

As its name implies, the Business and Users Group (BUG) includes representatives of the Bays' diverse business community (e.g., corporations, consulting firms, trade associations) and resource users, such as the New England Aquarium Divers' Club. Since its establishment early in the Massachusetts Bays Program, the BUG has been an active participant in the development of the CCMP, providing regular input on many of the action recommendations contained in the Plan. The technical expertise contributed by its business members in such areas as hazardous materials management (in particular, waste minimization and recycling), and the use of public/private partnerships have helped to shape various CCMP actions relating to toxic pollution prevention and control, oil pollution prevention and control, and stormwater runoff management. At the same time, BUG's resource user representatives have been strong advocates for improved public access to the coast, and have supported various CCMP initiatives, such as the Coastal

Access Guide, that will enhance the public's use and enjoyment of the Bays' bountiful land and water resources (see Action Plan for Enhancing Public Access and the Working Waterfront).

As the Massachusetts Bays Program moves from the planning phase into implementation, it will be important for BUG representatives to continue to meet and to provide their input on the broad range of actions recommended in the CCMP. Many of the complex water quality and habitat problems articulated in the CCMP call for creative solutions and the active participation and collective talent of all sectors of the community, not just government. The meetings of the BUG offer an excellent public forum for exploring and formulating new and creative environmental management strategies, and for facilitating the kinds of public/private partnerships that will be needed to implement those strategies.

MARINE STUDIES CONSORTIUM ACTION #15A.8:

The Marine Studies Consortium should continue to offer undergraduate marine science and policy courses; and, through the bi-annual Massachusetts Marine Environment Symposium, bring together diverse marine interests to promote better understanding of marine policy issues.

The Marine Studies Consortium is a non-profit association of seventeen colleges, universities, museums, and marine research institutions whose mission is to educate students and the public about environmental, political, and social issues which impact the coastal waters of Massachusetts.

The Consortium promotes a science-based approach to environmental decision-making through a wide array of programs, including an undergraduate curriculum in marine science and policy, local community forums, the bi-annual Massachusetts Marine Environment Symposium, and participation in the development of and revisions to the Commonwealth's water policies.

ACTION PLAN #15

ENHANCING PUBLIC EDUCATION AND PARTICIPATION

15B. DEVELOPING A STATE NONPOINT SOURCE EDUCATION AND OUTREACH STRATEGY

Nonpoint source pollution (NPS) occurs when rainwater and snowmelt run over farm fields, city streets, timber lands, lawns, and other surfaces. Contaminants, such as soil sediments, nutrients from fertilizers and sewage, and chemicals from pesticide use and other sources, are picked up as the water runs over the ground and through the soil. The contaminated rainwater and snowmelt ultimately flow directly into a surface waterbody (such as the ocean, a river, or a lake), or they seep into groundwater or enter a drainage system, which eventually carries the contaminants to a surface waterbody.

When all of these individual pollutant inputs are taken together, the impacts on coastal waters are staggering. Many national studies identify NPS pollution as the largest single factor contributing to coastal water pollution. In addition, unlike point source pollution from industrial pipe discharges and other direct sources, the sources of NPS pollution are extremely diverse and widespread.

In the past, the NPS pollution resulting from human activities and natural processes (such as erosion and plant and animal decay) was not significant enough to impair the ability of aquatic ecosystems to handle these contaminants. As human activities have increased, however, the quantity and diversity of NPS pollutants entering waterbodies have also increased. Today, in many areas, the levels of NPS pollution have adversely affected the health and productivity of coastal ecosystems. In addition, NPS pollution can prevent these waterbodies from meeting water quality standards. Continual NPS pollution can alter the quality of wildlife habitats, which, in turn, can reduce species diversity.

NPS pollution affects coastal waters when contaminated rain water and snow melt run directly into the ocean or into other coastal waters, such as estuaries and salt marshes. Even rain and snow that fall many miles inland, however, can impact coastal waters by carrying NPS pollutants to rivers that ultimately run to the sea. Consequently, all activities in coastal watersheds (the geographic areas from which water drains into coastal waterbodies) can cause coastal NPS pollution problems. Coastal waters, therefore, are affected by the activities conducted within a very large land area. In Massachusetts, the coastal watershed includes just over half

of the state.

One of the most costly results of coastal NPS pollution in Massachusetts is shellfish bed closings. More than 90,000 acres are currently closed. Over the past fifteen years, shellfish bed closings have increased dramatically, and many of these closings appear to be the direct result of NPS pollution from sources such as septic systems, as well as from domestic and farm animals. Because they are filter feeders, shellfish are very sensitive to water pollution. As they feed, they filter contaminants, as well as bacteria and viruses, out of the water and often store these substances in their body tissue. Consequently, shellfish that are contaminated with bacteria from human and animal wastes pose a serious threat to human health. If the bacterial count in coastal waters reaches a certain level (14 colonies per milliliter of water), shellfish beds must be closed, preventing people from harvesting the resource.

In addition, Massachusetts Bays Program research estimates that more than half of the oil and grease that enters the Bays is from nonpoint sources of pollution.

Clearly, the magnitude of the NPS pollution problem underscores the need for effective solutions. This ubiquitous pollution problem also suggests that the permit and compliance-oriented strategies used with point sources of pollution will be inadequate when addressing NPS issues. An effective education and information campaign that draws upon lessons learned through the Massachusetts Bays Program will be necessary to raise awareness of the NPS pollution problem and to empower communities, businesses, and individuals to take the necessary actions to reduce storm-water runoff and other types of NPS pollution.

In recognition of this need, the Coastal Nonpoint Pollution Control Program (s.6217), directed by the Massachusetts Coastal Zone Management office (MCZM) with the assistance of the Massachusetts Department of Environmental Protection (DEP), is aggressively pursuing outreach and technical assistance efforts on NPS issues throughout the Bays' watersheds. The outreach component of this approach focuses on raising awareness of NPS issues and educating the public about the seriousness of the problem

and available solutions. MCZM staff produce factsheets, brochures, newsletter articles, and other materials to spread this message. The purpose of the technical assistance component is to provide guidance and assistance to local governments, other state agencies, businesses, and individuals to assist them with the implementation of NPS controls, practices, and strategies. This assistance includes direct support in developing ordinances and regulations, technical guidance, training, financial incentives, demonstration projects, and other innovations to protect coastal water quality. MCZM also coordinates with a variety of other state agencies to ensure that education, information, and technical assistance needs on specific issues are met in the coastal communities.

DEP's Office of Watershed Management (OWM) is also involved with NPS outreach and technical assistance efforts statewide. OWM is responsible for implementing the state's Basin Approach to watershed management. DEP has divided the state into 27 major watersheds and basins, and assigned several technical staff people to serve as Basin Teams for each of these areas. DEP also has divided these basins into five separate groups. Each year, DEP works with the cities and towns within one of these groups to develop consistent and coordinated permitting strategies on point source and NPS pollution issues. Because the permits are effective for five years, this creates a continual cycle whereby every five years DEP returns to review and update all permits within each watershed.

OWM also employs a full-time outreach coordinator and technical assistance expert for the Basin Approach whose sole responsibilities are to inform communities and the public about the Basin Approach and to provide needed technical assistance to implement strategies. The Basin Teams also provide extensive technical assistance.

A wide variety of other state agencies also are involved with NPS outreach and technical assistance on specific topics. These agencies include:

- The Executive Office of Environmental Affairs (EOEA), which coordinates the Watershed Initiative and implements activities in the Neponset River Watershed, a model for other river basins throughout the state.
- The Department of Fisheries, Wildlife and Environmental Law Enforcement's Riverways Program, which focuses on NPS issues that relate to the state's rivers.
- The Department of Food and Agriculture, which looks at pesticides, soil erosion, fertilizers, and other NPS issues related to agriculture.
- The Department of Environmental Management, which focuses on forestry and other land use issues.

- The Metropolitan District Commission's Division of Watershed Protection, which concentrates its efforts on the Quabbin Reservoir and the Boston area.
- The Massachusetts Highway Department, which is involved with NPS pollution control from roads, bridges, and highways.
- The Massachusetts Bays Program, which provides education, information, and technical assistance on NPS issues to the 49 coastal communities along Massachusetts and Cape Cod Bays, and promotes the implementation of NPS pollution controls through its Comprehensive Conservation and Management Plan (CCMP).
- The Buzzards Bay Project, which also provides education, information, and technical assistance on NPS issues and promotes the implementation of NPS pollution controls through its CCMP for Buzzards Bay.

All of these agencies serve on the state's Nonpoint Source Outreach Coordination Committee. Other federal, local, and non-governmental members of the Committee include:

- University of Massachusetts Extension
- Massachusetts Water Watch Partnership
- U.S. Department of Agriculture, Natural Resource Conservation Service
- Metropolitan Area Planning Council
- Massachusetts Audubon Society
- Coalition for Buzzards Bay

The purpose of the Committee is to develop mechanisms to improve coordination among the agencies and organizations with major roles in NPS outreach and technical assistance and to identify and capitalize on opportunities for collaboration. The Committee is chaired by personnel from EOEA's Division of Conservation Services, State Commission for Conservation of Soil, Water and Related Resources.

Clearly, the Commonwealth of Massachusetts is positioned to provide extensive education and technical assistance on a variety of NPS pollution issues. The challenge for the state is to focus its energies on priority issues and to coordinate its efforts to provide adequate coverage, both by topic area and geography.

The following actions offer the means for meeting this challenge.

EOEA ACTION #15B.1:

The Executive Office of Environmental Affairs should develop and maintain a clearinghouse of NPS education, information, and technical assistance materials, as well as a database of available state NPS materials and programs.

RATIONALE:

A number of state agencies produce education, information, and technical assistance materials and/or offer programs on NPS pollution issues. In addition, numerous federal, local, and non-governmental groups also have NPS information and programs. Currently, however, no central repository for this information exists. Individuals looking for materials and programs on NPS issues must call each agency/organization individually, a task that is both time consuming and difficult because the appropriate contacts are often not easily identified.

An NPS clearinghouse/database would provide the following benefits:

- Copies of these materials would be available in a single location, improving research opportunities;
- Individuals would only have to contact one place to determine what NPS information the state has available; and
- Ultimately, the database could be made available on-line, which would allow broader access.

RESPONSIBLE AGENT(s):

All of the state agencies with NPS information/programs will be responsible for providing publications, other materials, and descriptions of their programs to the project. In addition, major federal, local, and non-governmental groups that opt to participate also will provide this information. The state's Nonpoint Source Outreach Coordination Committee will be responsible for overseeing the effort and will hire an intern to assemble the materials and create the database.

IMPLEMENTATION STRATEGY:

The state's Nonpoint Source Outreach Coordination Committee will conduct two separate surveys of state agencies with NPS responsibilities (and others represented on the Committee). The first survey will obtain information about the publications and other materials available on NPS issues. The second survey will obtain information about the technical assistance and other NPS programs that are

maintained. The survey information and copies of publications will be compiled by an intern, hired through the Massachusetts Water Watch Partnership. The intern will then develop the clearinghouse library and database.

The library and database will be updated periodically by the Committee so that information remains current. The Committee also will look into options for marketing the availability of the clearinghouse/database and making it available electronically through Internet access.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

The costs of this action will be minimal and will be assumed by the agencies involved.

POTENTIAL FUNDING SOURCE(s):

The Massachusetts Water Watch Partnership and DEP will fund the intern.

TARGET DATE:

1996

FURTHER INFORMATION:

For further information and assistance, contact:
Nonpoint Source Outreach Coordination Committee
The Executive Office of Environmental Affairs
Division of Conservation Services
State Commission for Conservation of Soil, Water and
Related Resources
(617) 727-9800, ext. 235

EOEA ACTION #15B.2:

The Executive Office of Environmental Affairs should develop and maintain a matrix, by topic, of NPS education, information, and technical assistance materials produced by state agencies and associated organizations.

RATIONALE:

Although a number of state agencies, as well as federal, local, and non-governmental groups, produce publications and/or offer programs on NPS pollution issues, no tools exist for these organizations to identify gaps in available information or to facilitate opportunities for collaboration. A matrix that lists the available education, information, and technical assistance materials and programs by topic covered would allow the state's Nonpoint Source Outreach Coordination Committee to:

- Identify topic areas that are not covered so that materials could be developed to fill these gaps;
- Determine areas where more than one agency/organization is developing materials or maintaining programs, allowing these agencies/organizations to collaborate in the future; and
- Plan future efforts with an eye toward filling informational gaps and fostering collaboration to improve products/programs.

RESPONSIBLE AGENT(s):

All of the members of the state's Nonpoint Source Outreach Coordination Committee, along with any other groups that opt to participate, will be responsible for providing information to complete the matrix.

IMPLEMENTATION STRATEGY:

The Nonpoint Source Outreach Coordination Committee will establish a subcommittee that will develop the matrix. The subcommittee will design a matrix that will list the agencies and other organizations that are participating and the NPS

topic areas covered. The subcommittee will then take the information from the surveys used to develop the NPS clearinghouse/database (see EOEAction #15B.1) to complete the matrix. The Committee will periodically update the matrix to keep it a current and working planning tool.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

The costs of this action will be minimal and will be assumed by the agencies involved.

POTENTIAL FUNDING SOURCE(s):

Not applicable.

TARGET DATE:

1996

FURTHER INFORMATION:

For further information and assistance, contact:
Nonpoint Source Outreach Coordination Committee
The Executive Office of Environmental Affairs
Division of Conservation Services
State Commission for Conservation of Soil, Water and
Related Resources
(617) 727-9800, ext. 235

EOEA ACTION #15B.3:

The Executive Office of Environmental Affairs should expand upon Massachusetts Bays Program efforts and develop a strategy for NPS outreach and technical assistance statewide that would coordinate the development and production of NPS education, information, and technical assistance materials, and provide technical assistance in order to implement NPS pollution controls.

RATIONALE:

A strategy for coordination and collaboration of outreach and technical assistance on NPS issues is necessary because of the large number of state agencies and federal, local, and non-governmental organizations involved with these issues. Currently, there is significant overlap in what these organizations are trying to accomplish. Also, because these organizations are faced with time and budget constraints, coordination and collaboration will allow resources to be used more widely and efficiently in order to spread a common message.

The goals of the coordination and collaboration strategy should be to:

- Identify existing information (see EOEAs Actions #15B.1 and 15B.2);
- Share agency and organization plans for producing information to identify and capitalize on opportunities for collaboration and to eliminate any redundancy of efforts;
- Ensure that NPS messages from the different state agencies are compatible; and
- Identify other key groups (e.g., federal, local, non-government) and bring them into the NPS outreach coordination process.

Coordination requires a significant effort up front to involve participants in the process and to develop a mutually-beneficial strategy. Since coordination can reduce duplication of effort and improve products and programs, the end result will amply justify the initial investment of time and resources.

RESPONSIBLE AGENT(s):

The state Nonpoint Source Outreach Coordination Committee will establish a subcommittee to develop the coordination and collaboration strategy. The full Committee will review the draft strategy and work to complete the final strategy. All members of the Committee will be responsible for implementing the strategy, and the Committee should expand its membership as more agencies and organizations

are brought into the planning process.

IMPLEMENTATION STRATEGY:

The subcommittee will work together to develop a draft strategy to meet the goals listed above. The strategy would outline the necessary steps to ensure coordination and collaboration, along with the responsibilities of the different agencies and organizations involved. The full Committee will then review and comment on the draft strategy and work together to finalize the strategy. The final strategy would be approved by the Secretary of EOEAs and implemented by the members of the Nonpoint Source Outreach Coordination Committee and their agencies and organizations.

LEGISLATION REQUIRED:

New legislation is not required.

ESTIMATED COST:

The costs of this action will be minimal and will be assumed by the agencies involved.

POTENTIAL FUNDING SOURCE(s):

Not applicable.

TARGET DATE:

1996

FURTHER INFORMATION:

For further information and assistance, contact:
Nonpoint Source Outreach Coordination Committee
The Executive Office of Environmental Affairs
Division of Conservation Services
State Commission for Conservation of Soil, Water and
Related Resources
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